DOCUMENT RESUME

ED 451 129	SO 032 688

AUTHOR	Brophy, Jere; Alleman, Janet
TITLE	Primary-Grade Students' Knowledge and Thinking about Communication as a Cultural Universal.
SPONS AGENCY	Spencer Foundation, Chicago, IL.
PUB DATE	2001-00-00
NOTE	271p.; For related studies on shelter, clothing, and food, see ED 437 311, ED 439 072, and SO 032 651.
PUB TYPE	Reports - Research (143) -- Tests/Questionnaires (160)
EDRS PRICE	MF01/PC11 Plus Postage.
DESCRIPTORS	*Communication (Thought Transfer); Communications; *Cultural Context; Curriculum Development; Educational Research; Instructional Improvement; Interviews; Primary Education; *Prior Learning; Social Cognition; Social Networks; *Social Studies; *Student Reaction
IDENTIFIERS	*Cultural Universals

ABSTRACT

The traditional K-3 social studies curriculum has focused on food, clothing, shelter, communication, transportation, and other cultural universals. Little information exists about children's prior knowledge and thinking (including misconceptions) about these topics. This study was designed to provide such information with respect to the topic of communication, and in the process to assess claims that primary-grade students do not need instruction in the topic because they learn what they need to know about it through everyday living. Individual interviews were conducted with 96 K-3 students, stratified according to grade level, achievement level, and gender. The students were asked about communication as a universal human need and the functions that it fulfills for us; methods of and limitations on communication in prehistoric times and among preliterate people who lived more recently; the impact of major inventions (writing, the printing press, radio, television, telephones, computers) on communication; communication by infants and among people who are blind or deaf; how people communicate when they do not share a language; how the environment and the culture shape vocabulary; the invention of new words; reasons for using symbols instead of words on certain traffic signs and other public notices; how the postal system works; why people read newspapers; and the workings of the television industry. The students' responses displayed many of the same patterns seen earlier in responses to interviews on shelter, clothing, and food: they knew more about the physical appearances of things than their underlying natures and more about the uses of products than about how they do what they do or what is involved in creating them. Sophistication of responses was related more closely to age (grade level) and personal experiences out of school than to achievement level or gender. Findings are discussed with emphasis on their implications for early elementary social studies. The study suggests that students stand to benefit considerably from more powerful treatments of cultural universals than those typically offered by textbooks. Contains a table and 51 references. The communication interview is appended. (Author/BB)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 451 129

PRIMARY-GRADE STUDENTS' KNOWLEDGE AND THINKING ABOUT COMMUNICATION AS A CULTURAL UNIVERSAL

Jere Brophy and Janet Alleman

Michigan State University

SO 032 688

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL HAS
BEEN GRANTED BY

Jere Brophy

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

The research reported in this manuscript was made possible (in part) by a grant from the Spencer Foundation. The data presented, the statements made, and the views expressed are solely the responsibility of the authors.

The authors wish to acknowledge and thank Carolyn O'Mahony who conducted the interviews and coded the transcripts; Jill Schaberg, who verified the transcripts; Tracy Reynolds who coded the transcripts; and June Benson, who transcribed the interviews and assisted in all aspects of data and manuscript preparation.

BEST COPY AVAILABLE

Abstract

The traditional K-3 social studies curriculum has focused on food, clothing, shelter, communication, transportation, and other cultural universals. Very little information exists about children's prior knowledge and thinking (including misconceptions) about these topics. The study was designed to provide such information with respect to the topic of communication, and in the process to assess claims that primary-grade students do not need instruction in the topic because they learn what they need to know about it through everyday living. Individual interviews were conducted with 96 K-3 students, stratified according to grade level, achievement level, and gender. The students were asked about communication as a universal human need and the functions that it fulfills for us; methods of and limitations on communication in prehistoric times and among preliterate people who lived more recently; the impact of major inventions (writing, the printing press, radio, television, telephones, computers) on communication; communication by infants and among people who are blind or deaf; how people communicate when they do not share a language; how the environment and the culture shape vocabulary; the invention of new words; reasons for using symbols instead of words on certain traffic signs and other public notices; how the postal system works; why people read newspapers; and the workings of the television industry. The students' responses displayed many of the same patterns seen earlier in responses to interviews on shelter, clothing, and food: They knew more about the physical appearances of things than their underlying natures, and more about the uses of products than about how they do what they do or what is involved in creating them. Sophistication of responses was related more closely to age (grade level) and personal experiences out of school than to achievement level or gender. Findings are discussed with emphasis on their implications for early elementary social studies.

Anthropologists and other social scientists often refer to cultural universals (sometimes called "social universals" or "basic categories of human social experience") as useful dimensions for understanding a given society or making comparisons across societies (Banks, 1990; Brown, 1991). Cultural universals are domains of human experience that have existed in all cultures, past and present. They include activities related to meeting the basic needs of food, clothing, and shelter, as well as family structures, government, communication, transportation, money or other forms of economic exchange, religion, occupations, recreation, and perhaps others as well. The term implies that activities relating to each cultural universal can be identified in all societies, but not that these activities necessarily have the same form or meaning in each society. On the contrary, it recognizes variations among societies (as well as among individuals within societies) in orientation toward or handling of common life events associated with each cultural universal (e.g., family structures are universal, but different cultures and individuals within cultures have different notions of what constitutes a family).

Cultural universals have special importance for early elementary social studies because much of the basic content taught in the primary grades focuses on them. The traditional reasoning has been that teaching students about how their own and other societies have addressed the human purposes associated with cultural universals is an effective way to establish an initial, predisciplinary knowledge base in social studies, preparing the way for the more discipline-based courses of the middle and upper grades. Two major reasons are cited commonly by supporters of the argument that organizing early social studies around cultural universals provides a sound basis for developing fundamental understandings about the human condition. First, human activities relating to cultural universals account for a considerable proportion of everyday living and are the focus of much of human social organization and communal activity, so instructional units on cultural universals provide many natural starting points for developing initial social understandings. Until they understand the motivations and cause-and-effect explanations that underlie these activities, children do not understand much of what is happening around them all the time. As they develop such understanding, previously mysterious behavior of their parents and other people significant in their lives becomes comprehensible to them, and they become equipped with intellectual tools that will enable them to begin to develop efficacy in these domains themselves.

Second, children from all social backgrounds begin accumulating direct personal experiences with most cultural universals right from birth, and they can draw on these experiences as they construct understandings of social education concepts and principles in the early grades. If cultural universals are taught with appropriate focus on powerful ideas and their potential life applications, all students should be able to construct basic sets of connected understandings about how our social system works (with respect to each cultural universal), how and why it got to be that way over time, how and why related practices vary across locations and cultures, and what all of this might mean for personal, social, and civic decision making.

Not everyone agrees with this rationale, or even with the notion of social studies as a pre- or pandisciplinary school subject organized primarily as preparation for citizenship. Some people advocate basing school curricula directly on the academic disciplines. They would offer separate courses in history, geography, and the social sciences, simplified as needed but designed primarily to pursue disciplinary goals rather than citizenship education goals. With particular reference to the primary grades, Egan (1988), Ravitch (1987) and others have advocated replacing topical teaching about cultural universals with a heavy focus on chronological history and related children's literature (not only historical fiction but myths and folk tales). We agree that K-3 students can and should learn certain aspects of history, but we also believe that these students need a balanced and integrated social education curriculum that includes sufficient attention to powerful ideas drawn from geography and the various social sciences, subsumed within citizenship education purposes and goals. Furthermore, we see little social education value in replacing reality-based social studies with myths and folklore likely to create misconceptions, especially during the primary years when children are struggling to determine what is real and enduring (vs. false/fictional or transitory/accidental) in their physical and social worlds.

Some of those who are opposed to a focus on cultural universals in early social studies have asserted, without presenting evidence, that there is no need to teach this content. Ravitch (1987) dismissed it as "tot sociology," arguing that it holds little interest or value for students, partly because they already know it from everyday experience. Larkins, Hawkins, and Gilmore (1987) also suggested that primary students already know most of this content, so there is no need to teach it in school. The authors of this report have disputed these arguments, suggesting that the knowledge about cultural universals that children develop through everyday experience tends to be tacit rather than well-articulated. Furthermore, much of it is confined to knowledge about how things are without accompanying understandings about how and why they got to be that way, how and why they vary across cultures, or the mechanisms through which they accomplish human purposes (Brophy & Alleman, 1996).

Recent developments in research on teaching suggest the need for data that speak to this issue. Increasingly, theory and research have been emphasizing the importance of teaching school subjects for understanding, appreciation, and life application, using methods that connect with students' prior experience and engage them in actively constructing new knowledge and correcting existing misconceptions. In mathematics and science, rich literatures have developed describing what children typically know (or think they know) about the content taught at their grade levels. This information informs the design of curriculum and instruction that both builds on students' existing valid knowledge and addresses their misconceptions.

There is potential for applying similar methods in social studies if more is learned about children's ideas about topics commonly taught at school. So far, little such information exists about topics addressed in K-3 social studies. Child development researchers have concentrated on cognitive structures and strategies that children acquire through general life experiences rather than on their developing understanding of knowledge domains learned primarily at school. Research in the Piagetian tradition has focused on mathematical and scientific knowledge, although there have been some studies of stages in the development of economic, political, and social knowledge (Berti & Bombi, 1988; Furnham & Stacey, 1991; Furth, 1980; Moore, Lare, & Wagner, 1985).

Nor have scholars concerned with curriculum and instruction developed much such information. There have been occasional surveys of knowledge about particular social studies topics (Guzzetta, 1969; Ravitch & Finn, 1987; U.S. Office of Education, 1995a, b). However, these have concentrated mostly on isolated facts such as names, places, or definitions, with reporting of findings limited to percentages of students able to answer each item correctly. To be more useful to educators, the research needs to emphasize questions that probe children's understanding of connected networks of knowledge and analyses that focus on qualitative aspects of their thinking about the topic, including identification of commonly held misconceptions.

Significant progress has been made in studying children's developing knowledge of politics and government. For example, children are much more aware of the administrative than the legislative or judicial aspects of government and they tend to view presidents as godlike figures notable for their power to get things done and their benevolence or caring about the needs of each individual citizen (Connell, 1971; Greenstein, 1969; Hess & Torney, 1967; Moore, Lare, & Wagner, 1985; Stevens, 1982). Research on economics knowledge has begun to uncover stages in children's development of understanding of, as well as common misconceptions in their ideas about, such topics as the functions of banks and the operations of retail stores (Berti & Bombi, 1988; Berti & Monaci, 1998; Byrnes, 1996; Jahoda, 1984; Schug, 1991).

Several teams of investigators have studied children's historical learning (Barton & Levstik, 1996; Brophy & VanSledright, 1997; McKeown & Beck, 1994). This work has demonstrated, for example, that much of the historical knowledge of fifth graders is organized in narrative form, so that it tends to feature stories focused around a few hero figures rather than less personalized causal analyses of historical trends. The students' narratives also tend to compress time and space by depicting face-to-face interactions between people whose life spans did not overlap (e.g., Columbus and the Pilgrims).

Very little information is available concerning children's knowledge and misconceptions relating to the cultural universals emphasized in K-3 social studies curricula. As a first step toward developing such information, we interviewed middle-class students late in the spring of second grade on various aspects of the topic of shelter (before and after they experienced an instructional unit on the topic). Shelter is not only a cultural universal but a basic need, and all of the students had had experience with it throughout their lives. Thus, if Ravitch and others had been correct in their assertion that children develop clear knowledge about such topics through everyday experience, we should have seen such knowledge demonstrated by middle-class children who were nearing the upper end of the primary-grade range. Instead, we found that the students' prior knowledge about topics relating to shelter was limited and spotty, tacit rather than well-articulated, comprised of loose collections of observations rather than well-integrated knowledge networks that included awareness of connections and understanding of cause-effect relationships, and often distorted by inaccurate assumptions or outright misconceptions (Brophy & Alleman, 1997).

These findings motivated us to launch a series of studies on developments across Grades K-3 in students' knowledge and thinking about cultural universals. Our intention is to generate findings that will have immediate value to social educators interested in developing more powerful curriculum and instruction for the early grades and teaching in ways that connect with students' prior knowledge. We also expect the findings to be of interest to scholars who study developments in children's general cognition or domain-specific knowledge.

All of these studies involve interviewing large samples of students stratified according to grade level (K-3), prior achievement level (high, average, low), and gender (boys, girls). In addition, the first two studies (on shelter and clothing) involved stratifying students according to the socioeconomic status (SES) of the populations served by their respective schools (upper middle-class suburban, middle-class suburban, lower middle-class urban). Interview protocols feature questions designed to elicit extended statements of students' thinking about the topic. Responses are coded for the presence of commonly mentioned ideas or response elements, and scores derived from these codes are subjected to quantitative statistical analyses. In addition, unusual responses or elaborations of common responses that go beyond the basic ideas represented by the coding categories are listed and discussed in the reports. Analyses focus on general levels of knowledge and trends observed across grade levels, but with attention to how these trends interact with prior achievement level and gender. Findings are discussed with emphasis on their potential implications for curriculum and instruction in primary-grade social studies and on what they suggest about more general developments in children's social knowledge and thinking. Complete technical reports concerning students' knowledge and thinking about shelter (Brophy & Alleman, 1999b) and clothing (Brophy & Alleman, 1999a) already are available, and a report about food has been submitted to ERIC. Subsequent reports will feature transportation, government, and family living.

Research on Children's Communication Knowledge

Not much research is available on developments in children's knowledge and thinking about communication, except for studies of their reactions to television programming in general and television advertising in particular. In the 1960s and 1970s there was a flurry of research on children and communication, but these studies did not focus on children's knowledge or thinking. Instead, they focused on the development of communication-related skills, such as gaining and maintaining adult attention in socially acceptable ways, obtaining needed information effectively, expressing their feelings verbally, and interacting effectively with peers (Wood, 1977). Interest in these topics has continued, although the skills involved are now more typically called social skills than communication skills. In the emerging field of media studies, research has focused on children as critical readers of media as text.

Children gradually learn about differences in the language that people use to communicate. Even as preschoolers, most American children understand that some people speak languages other than English and that English speakers in different social groups speak in distinct ways. For example, Hirschfeld and Gelman (1997) found that preschoolers predicted that people from minority races, people wearing unfamiliar clothing, or people living in unfamiliar dwellings were more likely than other people to speak an unfamiliar language rather than to speak English. Presumably children develop finer distinctions (e.g., recognizing English dialects and associating them with people from particular social or geographical backgrounds) as they get older.

Children also learn that some people's communication abilities are limited by sensory deficits (blindness, deafness) or physical impairments to their speech production mechanisms. We were unable to locate any studies of developmental trends in this knowledge, however, although we did locate curriculum packages designed to inform children about disabilities and teach them to empathize and interact productively with people who have disabilities (Del-Val et al., 1981; Lambert, 1994).

Most communication-related research on children has focused on their responses to mass media, particularly television. Studies have focused on the kinds of visual images and verbal messages being directed at children through the media, and how children respond to this input (e.g., the degree to which they understand that some of what they see on television is real and some is fictional, or that commercial advertising is intended to persuade them to purchase products or services). Concern about media manipulation of children has led to development of curricula designed to build media literacy, which has been defined as the ability to critically understand, question and evaluate how media work and produce meaning, how they are organized, how they mediate and construct reality, and how they impact our lives (Abdullah, 2000). These curricula typically seek to inoculate children again undue persuasion by teaching them to notice the messages and points of view being directed to them, to note the techniques being used to hold their attention and persuade them to a point of view, and to ask who created these messages and why (Feuerstein, 1999; Thoman, 1999).

Research indicates that children are not just passive viewers who merely absorb information from television. Instead, they actively process what they watch, and their strategies for doing so become more efficient as their general cognitive skills mature and they acquire more experience with television. Young children's attention tends to focus on salient stimuli. As they mature, conceptual information and information-seeking become more important than perceptual salience, and they begin to distinguish more efficiently between relevant and irrelevant material and between what is apparent and what is real. They are most affected by televised events that are perceived to be realistic or plausible and that involve characters with whom they identify. Heavy viewers who rely mostly on television as an information source are the most likely to accept television's version of reality. If they spend much of their time watching shows that depict violence or unrealistic and stereotypic portrayals of women and minorities, they may become more fearful, more biased, or less tolerant (Van Evra, 1990).

Wolf (1987) talked with 4-12 year-old children about television programs they were watching and found that most of them, even many of the 5- and 6-year-olds, had acquired considerable knowledge about conventions involved in television production and viewing. Most children understood, for example, that certain types of clothing and mannerisms distinguish "good guys" from "bad guys," that an initial panoramic scene is often used to indicate the location in which the upcoming action takes place, that music is often used to build anticipation of a climactic event or enhance the emotional impact of a scene, and that commercials are intended to persuade us to buy the products shown and that they present these products in ways that emphasize their desirability.

BEST COPY AVAILABLE

The Annenberg Media Literacy Study recently investigated the media literacy of children aged 6-11, using questionnaire and interview techniques. Focusing on children's ability to distinguish the real from the fictional in televised programming, the study found that children at all age levels showed good awareness of television illusions, with 92% knowing the Superman and Batman cannot really fly, 75% knowing that fights in dramatic programs are not real, and 78% agreeing that television advertising makes items like toys or candy look nicer than they really are. However, fewer than half of the children understood that televised sitcoms took place on sets and not in real houses. Described as coming from middle class homes in Philadelphia, not only did all of these children have televisions in their homes but 93% had VCRs, 63% had video cameras, 61% had operated the video cameras, and 25% had programmed the VCRs. Boys were more interested in and aware of technological aspects of television than girls were.

Whereas most children knew that fights in adventures shows did not really hurt people, that TV ads make things look nicer than they are, and that news anchors are not by themselves in the studio, only the older children typically knew that situation comedies are produced on sets (not regular homes) and that programs are paid for by producers, advertisers, and media corporations (Davies, 1997). Other studies of children's understanding of what is "real" on television have been reviewed by Chandler (1997).

Much of the research on children and television has focused on advertising, especially ads directed primarily at children. A study done in India found that children enjoyed watching ads on television, sometimes as much or more than the regular programming. The main characteristics of television ads that drew children to them included: (1) brevity and repetitiveness (the brevity makes them suited to the concentration spans of young children and the repetition guarantees that they "learn" them), (2) complete capsules (they convey a single main idea that is easy to grasp and remember), (3) music, (4) color, (5) technical superiority (often better than the regular programming), (6) emotional manipulation (emphasis on excitement, fun, sentimentality, mischief, or other emotions and personal problems easily understood and appreciated by children), and (7) role models (attractive people in attractive settings wearing attractive clothes, etc.). The youngest children in the study (8-year-olds) were beginning to recognize that advertisements are intended to sell a product or service. Even so, they expected these advertisements to be essentially honest, so they emphasized an informative role over a persuasive role for these ads. By age 10, most of them had begun to question the fundamental honesty of advertising (Unnikrishnan & Bajpai, 1996).

These naively trusting and generally quite positive reactions to television advertising were found at a time when television was just being introduced on a mass scale in India, so they may not hold for contemporary U.S. children who have grown up taking television for granted. This is suggested by a recent study of British children aged 8-12 who expressed a considerable degree of skepticism and even cynicism about television advertising (Buckingham, 2000). For example, many of the students understood that celebrities were paid for their product endorsements, questioned the legitimacy of survey information or "before-and-after" tests, or talked about "camera tricks" or other methods for enhancing the desirability of the products. The author concluded that the children were well equipped with cognitive defenses against the influence of television advertising, although he also noted that such defenses might not be used regularly under ordinary viewing conditions. He also noted that although the children understood what advertisements were attempting to do (i.e., persuade them to purchase), they knew much less about why these ads appeared on television in the first place (i.e., that sponsors paid television stations to air them). Henriksen (1996) also noted that even though children may recognize the persuasive intent of television advertising, they may not be very aware of the profit motives that underlie the development and airing of the ads.

A review of research done mostly in the United States and mostly during the 1970s and 1980s suggested conclusions that lie in between those based on Indian children somewhat new to television and British children who had grown up with it (Van Evra, 1990). These studies suggested, for example, that children from 5 to 8 years of age distinguish between programs and commercials based primarily on perceptual cues (e.g., a commercial is short, but a program is long), whereas older children distinguish the content of the messages (e.g., shows involve stories but commercials involve product selling). Children aged 5 or 6 are not particularly vulnerable to many commercials because they do not understand them very well, but 7- to 10-year-olds are more vulnerable to television manipulation. Those younger than 7 or 8 show little awareness of what a commercial actually is and its persuasive intent. By age 9, many children have had experience with products that they were disappointed in and have become suspicious of advertising claims. Awareness of the persuasive intent of commercials rose across childhood, although few children of any age showed high awareness of the larger world of television advertising, including the profit motives of the companies involved. Concerns about advertising directed at children have focused in particular on the undesired influences of ads for junk foods, as well as more generally on the role of television advertising in promoting a consumer culture among children.

Despite the wealth of research on children and television, we did not find studies relating to most of our questions probing children's thinking about how television works and how its invention changed the world. Nor did we find studies relating to most of our other questions about communication as a cultural universal.

Our Communication Interviews

We developed an interview protocol designed to elicit students' thinking about what we consider to be key ideas that ought to be emphasized in elementary social studies curriculum that treats communication as a cultural universal. The content base for the interview was synthesized from three general sources: (1) social studies education textbooks and other sources that identified key ideas about communication that are rooted in the social science disciplines; (2) information about communication typically included in elementary social studies textbook series or in children's tradebooks on the topic; and (3) our own ideas about the key features of elementary social studies units that focus on cultural universals and are designed to teach the material for understanding, appreciation, and life application (Brophy & Alleman, 1996). We believe that the most basic and important ideas for children to learn about communication include: understanding its status as a universal human need and the functions that it fulfills for us; methods of and limitations on communication in prehistoric times and among preliterate people who lived more recently; the impact of major inventions (writing, the printing press, radio, television, telephones, computers) on communication; communication by infants and among people who are blind or deaf; how people communicate when they do not share a language; how the environment and culture shape vocabulary; the invention of new words; reasons for using symbols instead of words on certain traffic signs and other public notices; how the postal system works; why people read newspapers; and the workings of the television industry.

After identifying and sequencing the content base to be addressed, we developed and revised initial drafts of the interview protocol. These drafts featured primarily open-ended questions, typically followed by planned probes, designed to elicit extended statements of students' knowledge and thinking about the topic. Probes were designed to reveal whether students understood and could explain the concepts or relationships addressed by the initial questions (and if not, what alternative concepts or relationships they might have constructed).

The "funnel" interview technique was used, in which initial broad questions encourage students to make extended statements about a topic, attending to whatever aspects of the topic they select for focus on their own initiative, and explaining themselves in their own words. Probing then begins with follow-up questions asking (if necessary) for clarification or elaboration of what students have said in their initial statements. Finally, more specific questions are asked (if necessary) to call students' attention to aspects of the topic that they did not address spontaneously. This approach maximizes the degree to which students' responses reflect their own unique stances toward and construction of knowledge about the topic, and it minimizes the cueing of specific responses through suggestive questions. Yet, it also ensures that all of the students address certain key aspects of the topic (either because they do so spontaneously in responding to initial broad questions or because they are asked more specific questions later).

Successive drafts of the interview were piloted with students who were not involved in the later study. This pilot work led to revisions designed to make sure that all questions were clear, to specify probing and follow-up questions more completely, and to eliminate questions that were too easy or difficult to be useful. This process eventually yielded the final version of the interview shown in Appendix 1.

Sample

Our first two studies (on shelter and clothing) involved interviews with 216 students, 54 in each of Grades K-3, stratified within each grade by the socioeconomic status (SES) level of the community, the students' prior achievement levels, and the students' gender. The SES variation was introduced by conducting one-third of the interviews in an upper-middle class suburban community, one-third in a middle/working-class suburb, and one-third in lower-middle/working class neighborhoods of a small city. Together, these samples subsumed the middle three-fourths or so of the SES range in the general population.

The patterns of findings that appeared in the first two studies led us to discontinue further systematic sampling across the SES range, because the observed SES differences in these studies were relatively small and not especially interesting or informative. Students from higher SES backgrounds tended to have more, or more accurate, knowledge than students from lower SES backgrounds, but the same general developmental patterns were observed in each group. We did not find theoretically or practically interesting group contrasts (e.g., contrasts suggesting the existence of qualitatively different developmental paths or constructions of knowledge that were unique to particular SES groups). Consequently, we concluded that in our future work it would be more efficient to concentrate initial studies at the middle of the SES distribution (by interviewing in the same middle/working class suburb for which the middle SES samples in the first two studies were drawn). Possible group differences would then be addressed in follow-up studies. For example, we followed up the shelter study by interviewing students who live in Manhattan, a highrise, high-density residence area that contrasts with the lowrise, low-density communities of the Michigan students interviewed in the initial study. Also, given that our food interview included several questions on farming and the origins of food, we followed up the initial food study with interviews of students from farm families.

The students interviewed for this study attended the public schools of a middle/working class bedroom suburb of a small city (population about 160,000). The community is average or slightly above average on most socioeconomic and educational indices. During the years when these interviews were conducted, the community's high school graduation rate was 83% and the percentages of its fourth graders who achieved "satisfactory" scores on the state's achievement tests were 49% percent for reading and 65% for mathematics.

Reflecting their school populations, the majority of the students we interviewed were white. We did not consider race or ethnicity in identifying students for the sample, except for the stipulation that all interviewees must have spent all or at least most of their childhood in the United States. Recent immigrants or students who had spent most of their preschool years in other countries were not included, because an assumption underlying the work was that what the students knew about communication (other than what they had been taught at school) had been learned in the process of growing from infancy in the contemporary United States (particularly through home and neighborhood experiences and exposure to television and other media).

Interviewees were selected from among students whose parents gave us permission to do so. Most parents who returned our forms did give such permission, although a significant minority of parents never returned the forms despite repeated requests. Once the potential interviewees in a given classroom were identified, they were listed alphabetically by gender and the teacher was asked to characterize them, within gender groups, as being within the upper third, the middle third, or the lower third in general academic achievement. When we had access to more students in a given cell (e.g., high achieving male first graders) than we needed, the students to be interviewed were selected randomly from within the eligible group. When additional students were needed to fill out certain cells, we expanded sample recruitment to a nearby school in the same district that served a very similar student population.

Collection and Preparation of Data

Students were interviewed individually. The interviews typically lasted about 30 minutes and were conducted in small offices or other locations within their schools but outside of their classrooms. To facilitate rapport with students and make sure that their responses were preserved verbatim, the interviews were tape recorded, using a microphone that could be placed unobtrusively on the table and did not require either the interviewer or the student to handle it or speak directly into it. Interviewers were instructed to establish good rapport with the student before.beginning and then to conduct the interview in a relaxed and conversational style rather than a more formal or test-like style.

The tape recorded interviews were transcribed by one person and then listened to by a second person who identified omissions and inaccuracies in the transcripts. Data for statistical analyses were then developed by coding the corrected transcripts.

Coding the Transcripts

We did not attempt to force students' responses into predetermined coding categories. Instead, we allowed the categories to arise from the data, using what have been called analytic induction methods for developing grounded theory (Bogdan & Biklen, 1982; Glaser & Strauss, 1979; Patton, 1990). Coding schemes were developed by reading responses to each question and identifying common ideas (embodied in similar statements) that represented alternative ways to respond to the question. Responses then were coded for the presence or absence of mention of these common ideas. Multiple codes were assigned if the student mentioned more than one of the ideas. In addition to categories encompassing common ideas, each coding scheme contained an "other" category for flagging rare or unique responses.

After initial versions of the coding schemes were developed and refined, reliability was established between two coders who coded one-fourth of the transcripts (stratified according to grade level, achievement level, and gender). Upon completion of this coding, the two sets of codes were compared and inter-coder agreement percentages were computed. Most coding schemes initially met our criterion of 60% exact agreement across coders. When coding schemes failed to meet the inter-coder agreement criterion, the coders analyzed the problem and made adjustments in the coding schemes, then coded the one-fourth sample of responses again. All of the revised coding schemes met the inter-coder agreement criterion at this point. Across the 37 coding schemes used, exact agreement percentages ranged from 60% to 100%, averaging 79%.

Once the coding schemes had met the reliability criterion and been revised as needed (to incorporate minor alterations or elaborations suggested by insights developed while coding to establish reliability), the two coders used them to code all 96 interviews. Upon completion of their independent coding, they compared their codes and negotiated agreement on all discrepancies. They also developed a running list of the rare and unique responses that had been coded into the "other" categories, as well as any unusual elaborations of common ideas that seemed worth preserving for possible inclusion in this report. Thus, the report encompasses not only the commonly observed response variations that were amenable to statistical analysis, but also the rare or unique responses and any elaborations on common responses that seemed worth including because they appeared to have theoretical or practical significance.

Once coding was completed, the codes were converted into scores that became the bases for statistical analyses. In most cases the codes were used as is. However, some commonly occurring responses that originally were coded in the "other" category were broken out to create new scores, and some categories that were coded too infrequently to serve as a basis for useful statistical analyses were folded into related categories or simply omitted from such analyses. For example, Question 4 asked how people communicated back in the cave days. Responses to this question were originally coded as follows:

0. Doesn't know/no relevant response
1. They talked (like today)
2. They grunted, growled, made vocal noises
3. They talked in a different language (e.g., Spanish)
4. They used sign language or pantomime
5. They used lip reading
6. They wrote or drew (typically on walls or ground)
7. They had to communicate face to face because there were no telephones or mail
8. Other

Inspection of the initial codes indicated that only two students said that cave people communicated through lip reading and that most of the "other" codes were for students who said that there was a time when people didn't have any language at all (i.e., couldn't communicate through speech). Consequently, in moving from the initial codes to the final scores that would be analyzed statistically, the "other" responses stating that there was a time when people didn't have language were subsumed within their own separate category, and the remaining "other" responses and the "lip reading" responses were dropped (although these would be included in the section on rare and unique responses to Question 4). As a result, the following scores for Question 4 were analyzed statistically:

0. Doesn't know/no relevant response
1. They talked (like today)
2. They grunted, growled, made other vocal noises
3. They talked in a different language
4 They used sign language or pantomime or acted things out
5. Says that there was a time when people didn't have language, couldn't talk
6. They wrote or drew (typically on walls, ground, rocks)
7. They had to have face-to-face communication because they didn't have telephones or mail then.

Data Analysis, Interpretation, and Presentation

Scores derived from the codes were subjected to statistical analyses designed to reveal trends in the sample as a whole as well as contrasts across subgroups of students who differed in grade level, achievement level, or gender. These analyses included frequency distributions and means reflecting the degree to which various ideas were expressed across the sample as a whole and within its stratified subgroups, correlation coefficients indicating the direction and degree of relationship among the variables, and Chi-Square analyses indicating when subgroup differences were large enough to reach statistical significance.

Initial inspection of the results of these analyses indicated that (1) the response patterns to most questions featured statistically significant and often quite dramatic grade level differences showing increases in level and accuracy of knowledge across the K-3 range, (2) the achievement level differences, and (especially) the gender differences were much smaller and less likely to reach statistical significance, and (3) most of the achievement level differences that did appear were in the expected direction and thus not especially interesting or informative (that is, students who were higher in prior achievement level tended to have more, or more accurate, knowledge than students who were lower in prior achievement level, but the same general developmental patterns were observed in each group).

Given the uniformity of this pattern (with very minor exceptions that are noted when the relevant data are discussed), we decided to organize the presentation of findings in this report as follows. First, findings from related clusters of questions are presented together. For each question cluster, data presentation begins with discussion of descriptive statistics and the progressions in students' knowledge across Grades K-3, illustrated with excerpts from eight students' interview responses. We then present the findings on achievement level and gender differences. Except where the data indicate otherwise, we treat these group differences as relatively minor variations on the main themes established by the grade level differences.

Next, we turn to the correlational data, reporting noteworthy patterns that appeared in the relationships between the response categories under discussion and the categories used to code responses to other questions in the interview. These relationship patterns help us to interpret the meanings and implications of the various response categories, both in their own right and relative to one another. They are especially helpful when the grade level, achievement level, or gender differences found for a response category seem counterintuitive (if the meaning of the category is taken at face value). Sometimes, the correlational patterns indicate that the responses coded into a category had different meanings or implications (e.g., were either more or less sophisticated) than the category descriptor seemed to imply.

After presenting these quantitative data, we turn to a more holistic analysis of what the findings suggest about developments in children's knowledge and misconceptions about communication as they progress through Grades K-3. Along with the data shown in the tables, these analyses include consideration of the rare and unique responses and unusual elaborations of common responses that were recorded and analyzed for potential significance. Taken together, these findings are discussed with reference to previous findings (where available), the understandings we have developed about growth and change in children's knowledge and misconceptions relating to communication, and the potential implications of these understandings for curriculum and instruction in elementary social studies.

Why People Need to Communicate

The first question on the interview assessed students' knowledge of the meaning of the term "communication:"

Question 1. Today we're going to talk about communication. That's a big word—do you know what it means?

If the student did not know what the word meant or defined it or gave examples in a way that suggested an overly constricted or specific meaning, the interviewer explained that communication means talking or sending messages to other people. Once this was established, the following questions focused on communication as a basic need and cultural universal, and on the functions that communication fulfills in our lives:

Question 2. All over the world, people communicate by sending messages or talking. Do they do that just because they like to, or do they need to? . . . When would be a time that people need to talk? . . . How would our lives be worse if we couldn't talk?

Question 3. Some animals communicate by making noises, like dogs bark at each other. But we don't have to bark, we can talk. What does talking allow us to do that dogs can't do? . . . Is talking better than barking? . . . Why?

Analyses of responses to Question 1 indicated that only 26 students were able to define communication adequately. Of the rest, 58 were unable to respond and 12 gave responses that were incorrect or overly specific (e.g., speaking in sign language or a language other than English, understanding each other or helping others). Consequently, more than two-thirds of the students needed to be told that communication involves talking or sending messages to other people.

The first part of Question 2 (we will call it Question 2A) asked whether people merely like to communicate or whether they need to (at least at times). A heavy majority (84) of the 96 students said that humans need to communicate. Of these, 14 were unable to give examples of when or why we need to communicate, but the others identified one or more of the following situations: in emergencies or when something is harming us (30), in order to participate in school or work activities (16), to communicate or understand feelings or needs (15), to make plans, such as to meet a friend (11), to communicate with family members (10), and to ask or answer questions (8). At this point in the interview, all of the students were thinking in terms of face-to-face or telephone conversations rather than written communications.

Question 2B further pursued the topic of the functions that communication plays in our lives by asking how our lives would be worse if we couldn't talk with one another. Most of the students were able to communicate one or more ways in which our lives would be worse, although 11 students couldn't respond to this question and another 10 said that our lives would be worse but could not explain. Common explanations included: It would be difficult to understand each other, we would not be as well informed, or we could not get needed information easily (27), we would have to use sign language, read lips, or communicate in writing (26), we would be isolated from others, lonely, or unable to share our feelings (13), we wouldn't be able to get help as easily in emergencies or when sick or hurt (8), and we wouldn't be able to learn as easily (6). In addition, six students mentioned various physical impediments that could inhibit speech, because they didn't realize at first that the "we" in the question referred to all people, not just a few individuals who were unable to speak.

The references to reading lips or writing messages are just two examples of a common phenomenon in responses to this and other interviews: When asked to think about hypothetical situations, the students often failed to consider the connections among things and responded as if everything else in the world as we know it would remain the same except for changes in the particular items identified in the question. In this case, the students who said that our lives would be worse if we couldn't talk because we would have to read lips or write messages failed to realize that there would be no possibility for lip reading if people did not speak, and that in the absence of spoken language, the development of written language would be extremely unlikely.

Note that the categories for Question 2B are numbered 0, 1, 2, 3, 5, 6, 7, and 8, respectively (i.e., Number 4 is missing). Here and throughout the table, these occasional missing numbers indicate instances in which categories used in the original coding were dropped from the analyses because they were not used frequently enough to justify their retention. Any responses originally coded in these categories were redistributed to more commonly used

BEST COPY AVAILABLE

categories (where appropriate) or else omitted entirely from the statistical analyses but included in the listing of rare and unique responses.

Question 3 invited the students to consider the functions of human communication by comparing human speech with the barking of dogs. Twenty students were unable to respond to this question, six said that barking is just as good a communication mechanism for dogs as talking is for humans, and another six could only say that barking is noisy, annoying, or hurts your ears. However, 38 students recognized that speech is easier to understand than barking and 26 elaborated more specifically by saying that we can communicate better through talking, say more or more complex things, express emotions and plans, or explain about emergencies.

The following examples are representative of responses to the first three questions. They are segments drawn from verbatim transcripts of the interviews, although they have been edited to eliminate extraneous material (mostly final probes that failed to elicit any additional response). Here and throughout the rest of the report, the examples are drawn from the transcripts of interviews of eight average achieving students, one boy and one girl from each of Grades K-3.

Kindergarten

Jered

1. No.

2. Um . . . need to, I think. (How come they need to?) Um . . . I don't know. (Well, what about you? You talk—there are times when you need to talk. Why would you need to talk sometimes?) When you're asking stuff to people. (How would people's lives be different if we couldn't talk . . . do you have any idea?) Nope.

3. I don't know.

Kate

1. No.

2. Need to. (How come they need to?) Just in case they need to talk to people and they wanted to make a plan to go somewhere. (How would people's lives be different if they couldn't talk to each other?) I don't know.

3. Talk on the telephone. (Anything else?) No.

First Grade

Chris

1. Um . . . No.

2. They need to. (OK, why do they need to sometimes?) I don't know. (How do you think our lives would be different if we couldn't talk to each other?) They would have lots of things in their head—all the things they had to say would be in there. (But they wouldn't be able to say them, right?) Yeah.

3. I don't know. (Well, think of it this way. Is it better to be able to talk or to bark?) Talk. (Why?) Because the other person might not understand you if you barked.

Lauren

1. No.

2. They like to, and they want to. (When would be a time that people needed to talk?) If someone was sick and they wanted them to feel better. (How would our lives be different if we couldn't talk to one another?) You would have to bring messages to each other so they could know what you wanted to say. (If we couldn't talk to one another, would our lives be better or worse?) Worse. (Why?) Because you couldn't talk and they might not know what you want to say, so you might want to write messages to them.

3. We can and they can't and we can't understand what they're doing. (Is talking better than barking?) A little bit sometimes. (Why?) So they can know more what they're saying and sometimes . . . because you can't understand what dogs are saying but they can understand what we're saying.

Second Grade

Mark

1. Yeah, it means like you can talk to someone else on the phone, like communicating.

2. It kind of depends. (Tell me about that.) Like . . . let's say you're like at work and then you have no car and you're married and you have no car cause the father took you, and you like have to have it cause you're having a baby—you might have to call to communicate. Sometimes you might just want to talk to them, like come over, like come

over to play. (How do you think our lives would be different if we couldn't talk to one another?) Kind of boring, probably. You couldn't play or anything, all you could do is do stuff by your house and all you could do is talk to your family and all that. (Well, you wouldn't be able to talk to them if you couldn't talk, right?) Oh. Kind of be boring because if you couldn't talk to anybody, like the same thing of having a baby, you can't talk to anybody.

3. Um . . . maybe like we can laugh and they can't or something. (Anything else that talking allows people to do that animals can't do?) Talking on the phone.

Emily

1. No.

2. I don't know. (When would be a time that people needed to talk?) You mean like talk on the phone? (Yeah, OK. When would be a time when they would need to?) I don't really know. (How would our lives be different if we couldn't talk to one another?) I don't know. (Would our lives be better or worse if we couldn't talk to each other?) Worse. (Why?) Cause you wouldn't get to talk to each other.

3. I don't know. (Is talking better than barking?) Yeah. (Why?) Because when you bark, you don't even know . . . people don't even know what you're saying or something.

Third Grade

Dale

1. No.

2. They need to. (How come?) So they can get to know each other. (How do you think our lives would be different if we couldn't talk to each other?) I don't know. (Would it be better or worse?) Worse. (Why?) Cause no one would know each other and would have nothing to do with each other.

3. I don't know. (Is talking or barking better?) Talking. (Why?) So we can talk to each other and make friends and stuff.

Chelsea

1. Probably how to do things, to talk to someone in a different way.

2. They need to. (Why? . . . When would be a time that people need to talk?) When it's like an emergency or they feel like it, or somebody wants you to spend the night or something. (How would our lives be different if we couldn't talk to one another?) It'd be like . . . we'd be trying to communicate, but it'd be really hard. We'd have to use our

hands, if we knew how to. (I see you started to use your hands. Now, would our lives be better or worse?) Worse. (Why?) Probably because it'd be really hard to talk and you didn't learn how to—you were born without a voice box or something, so you'd probably have to use your hands.

3. It means we don't have to do weird stuff, like do motions [i.e., pantomime, pointing]. Sometimes we just . . . like what I'm doing right now—talk. (Is talking better than barking?) Yeah, way better than barking because we're not animals. (But why is it better?) Probably because it's better for you to talk than bark because then people will understand you. We don't understand dogs.

Grade Level Differences

Descriptive statistics and information from the Chi-square analyses of scores derived from the coding of Question 1-3 (and all of the other questions in the interview) are given in Table 1. The numbers in the columns for the total sample (N = 96), the four grade level groups (N = 24), the three achievement level groups (N = 32), and the two gender groups (N = 48) are simple frequency scores indicating the numbers of students in the sample as a whole and within each grade level, achievement level, or gender group who were coded for mentioning the idea represented by the response category. Sets of scores are underlined if the analyses described below identified statistically significant relationships between the frequency of use of a response category and the students' grade level, achievement level, or gender.

The score distributions were subjected to Chi-square analyses to determine whether the differences observed reached the .05 level of statistical significance. Two forms of Chi-square analysis were used. The first, used with all of the distributions, was a conventional Chi-square analysis that assesses the probability of obtaining the observed group totals if it is assumed that the variable appears with the same frequency in each group within the population as a whole (in other words, if it is assumed that there are no group differences). This Chi-square test does not take into account that the groups might be ordered on a dimension (e.g., grade level or achievement level). Consequently, a statistically significant result simply indicates that the variance in the group totals exceeds that which might be expected to occur because of chance variations in sample characteristics.

A related analysis, the Mantel-Haenszel Chi-square test, was used to assess the statistical significance of trends observed in the grade level and achievement level distributions. These two distributions involved a progressive ordering of their categories (from kindergarten through third grade, and from low through average to high achievement level). The Mantel-Haenszel statistic takes into account such progressive ordering and tests for directional trends (i.e., tendencies for the scores to either rise or drop as one moves up the grade or achievement levels). Statistically significant Mantel-Haenszel Chi-squares do not imply that the difference between each successive grade level or achievement level score is statistically significant, or even necessarily consistent with the overall trend. However, they do indicate that a statistically significant rising or dropping trend was detected across the four grade levels or the three achievement levels.

In compiling the data for Table 1, we first examined the grade level and achievement level comparisons for the significance of the Mantel-Haenszel Chi-square. If this Chi-square was significant at or below the .05 level, we underlined the group totals and recorded the phi coefficient (comparable to a conventional correlation coefficient) to indicate the direction and level of strength of the relationship between grade level (or achievement level) and the frequencies of coding of the response category in question. If the Mantel-Haenszel Chi-square did not reach the .05 level of statistical significance, we examined the findings for the conventional Chi-square. Usually this Chi-square also failed to reach significance, in which case we did not underline the group totals or record a phi coefficient in the table. In a few instances, the Mantel-Haenszel Chi-square was not statistically significant but the conventional Chi-square was. This indicated that there was statistically significant variation across the groups being compared, but this variation did not take the form of a systematically rising or dropping trend that paralleled the grade level or achievement level progression. Where these unexpected nonlinear group differences appeared, we underlined the group totals and placed the letters "NL" (standing for nonlinear) in the phi coefficient column. In summary, for the grade level and achievement level analyses, we (1) underlined the set of group totals and included the phi coefficient when the analyses indicated a significant directional trend, (2) underlined the set of group totals and entered "NL" when the analyses indicated significant nonlinear variance, and (3) did not underline the set of group totals and did not enter either a phi coefficient or the letters "NL" when neither of the Chi-square analyses yielded a significant result.

The Mantel-Haenszel Chi-square test was not appropriate for assessing the statistical significance of gender differences, because the two gender groups (boys, girls) are not ordered on a continuum. Consequently, the conventional Chi-square test was used for this purpose. When this test indicated a statistically significant difference between the two gender groups, the gender totals were underlined and the phi coefficient was entered to indicate the direction and strength of the relationship (negative phi coefficients indicate that the boys were coded significantly more frequently in the category than the girls; positive phi coefficients indicate that the girls were coded significantly more frequently than the boys). When the Chi-square test failed to indicate statistical significance, the gender totals were left without underlining and no phi coefficient was entered. To simplify the table, decimal points were omitted from all of the phi coefficients recorded.

Analysis of the scores derived from the coding of responses to Question 1 indicated that both sets of group totals showed significant relationships to grade level (see Table 1). The first relationship was a negative one, indicating that failures to respond to the question were more common in younger than older students. This same trend appeared for almost all of the questions in all of our interviews. There is considerable variation from question to question in the percentage of students who say "I don't know" or who are unable to provide a substantive response that speaks to the question. Whatever their frequency may be, however, these failures to respond to questions tend to be concentrated in the younger students, especially the kindergarteners. In this case, 58 students were unable to respond to Question 1, of which 22 were kindergarteners and 18 were first graders.

The other significant relationship was positive, indicating that the older students were much more likely to have defined communication as talking, having conversation, or speech. Twenty-four of the 26 students who supplied these definitions were second- or third graders.

Only two of the categories for responses to Question 2A showed significant relationships with grade level. Younger students were more likely to be unable to respond to the question and older students more likely to say that people need to communicate in order to participate in activities at school or on the job. The categories for responses to Question 2B showed four significant relationships with grade level. Younger students were more likely to be unable to answer the question or to say that our lives would be worse if we couldn't talk but then be unable to explain themselves further. In contrast, older students were more likely to explain that inability to talk would make it difficult for us to understand each other and get needed information, as well as to render us isolated from others, lonely, or unable to share our thoughts and feelings.

Analyses of responses to Question 3 indicated that kindergarteners were more likely than older students to be unable to answer the question and older students were more likely to explain that talking is better than barking because we can communicate better, say more or more complex things, express emotions and plans, or explain about emergencies more clearly through speech. There was also a nonlinear relationship that appeared because kindergarten students were especially unlikely but first graders were especially likely to say that talking is easier to understand than barking. This nonlinear pattern was not expected, and we have no explanation for it (the correlations between categories for responses to Question 3 and all of the other coding categories did not yield interpretable patterns, and nothing that we know about cognitive development or the school curriculum across the K-3 range suggests an explanation for this finding). We also are unable to interpret most of the other nonlinear relationships that appeared in our analyses. Rather than continue to repeat our explanations for why this is the case (the nonlinear patterns were unexpected, their reliabilities are unknown, and nothing in the correlational analyses or the extant research literature suggests clear interpretations), throughout the rest of this report we will simply describe nonlinear patterns without commenting on them (except in a few instances where we do have interpretations to suggest).

In general, the findings from the analyses for the first three questions indicate that the older students were able to say more about communication than the younger students, and that most of what they had to say was accurate as far as it went. Although only half of them could define the term "communication," most of them understood that people sometimes need to communicate, could give examples of when such communication is required, showed some understanding of how our lives would be more difficult if we lacked speech, and could explain why human speech is a more efficient form of communication than the barking of dogs. Younger students, especially kindergarteners, were much less successful in these respects.

Achievement Level and Gender Differences

Analyses involving response categories for the first three questions revealed seven significant relationships with achievement level and two with gender. Lower achievers were more likely than higher achievers to be unable to define communication and to respond to Question 2A by saying that people merely like (rather than need) to communicate. Higher achievers were more likely than lower achievers to provide an accurate definition of communication in responding to Question 1, to say that we need to communicate in emergencies or to participate in school or work activities in responding to Question 2A, to say that our lives would be worse if we couldn't talk because it would be more difficult to understand each other or get information in responding to Question 2B, and to say that talking is better than barking because it is easier to understand in responding to Question 3. These achievement level differences were similar to those found in our previous studies in that: (1) they generally paralleled the grade level findings and indicated that higher achievers were more likely to be able to respond to the questions and more likely to give sophisticated responses when they did, and (2) however, these achievement group differences were generally less pronounced and less often statistically significant, compared to the grade level differences.

The gender analyses indicated that five of the six students who answered Question 2B with an initial focus on physical speech impediments in individuals were boys. There was an almost significant tendency in the opposite direction suggesting that girls were more likely to say that life would be worse if we couldn't talk because we would have to use sign language, read lips, or write messages. Both of these are low-level responses to the question and neither seems to be connected with well-established gender differences.

The other significant gender difference indicated that boys were more likely than girls to say that people need to communicate in order to participate in school or work activities. This difference can be interpreted if viewed in connection with an almost significant tendency for girls to be more likely than boys to say that people need to communicate in order to understand feelings or needs. This contrast can be seen as connected to the more general pattern of gender differences in relative emphasis on instrumental vs. expressive use of language in social interaction.

Relationships Among Response Categories

Although our interests lay more in group differences in response patterns, we also correlated scores for the different response categories, within and across question clusters, to see if any noteworthy relationships emerged. Most of the significant correlations were not especially interesting because they fit into one of three expected patterns. First, many were logically necessary negative correlations between mutually exclusive category alternatives within the same cluster (e.g., there was a negative correlation between failure to define communication and the category used to code the definitions that were given by the students who were able to do so). Second, some were logically necessary positive correlations that reflected part-whole relationships. For example, there were positive correlations between the categories for various types of good examples given in response to Question 18 (which asked about words used today that did not exist 50 years ago) and a later category used for indicating that in responding to Question 18, the student provided at least one good example. Third, there was a general tendency toward correlation within and across clusters in the length and quality of the students' responses (i.e., certain students were more likely than others to be unable to respond or to respond poorly to our questions; certain students were more likely than others to consistently make lengthy and complex responses; and certain students were better informed than others and thus more likely to consistently make sophisticated responses). Given that these three types of relationships were expected to appear and that the explanations for them are well understood, we will not describe them in this report unless there is some special reason to do so.

In addition to these expected relationships, however, the correlational analyses sometimes identified statistically significant relationships between response categories that would not necessarily have been predicted and that indicated interesting connections among students' ideas. Most of these interesting relationships involved categories that reflect qualitative differences in the ways that students approached the questions, as opposed to categories that reflect differences in the amount or accuracy of their knowledge.

Interesting intercorrelations involving categories for responses to Questions 1-3 were limited to relationships indicating the sophistication of the responses. Students who answered Question 2A by saying that people do need to communicate but then were not able to give examples were more likely than other students to be unable to respond to many other questions on the interview. In contrast, students who were able to define communication in responding to Question 1 also were more likely than other students to respond to Question 2 by saying that our lives would be worse if we couldn't talk because it would be difficult for us to understand each other and get needed information, as well as to answer Question 3 by saying that talking is better than barking because it allows us to communicate better, say more or more complex things, express emotions and plans, or explain about emergencies.

These three responses were part of a "maturity set" of response categories that were coded more frequently for older and better informed students. Across the interview as a whole, this maturity set also included stating that cave people wrote or drew on walls or on the ground; knowing that Indians communicated among themselves before the arrival of Columbus (but in their own language); understanding that the chief of a preliterate Native American tribe, in order to get a message to the chief of a tribe five miles away, would have to go personally or send someone to deliver the message verbally; understanding that Native Americans did not have libraries because they didn't have books; stating that the invention of writing changed the world by giving it a better way to communicate, making learning and communication of information easier, making it possible for people to send written messages or letters, or eliminating the need for people to be face to face in order to communicate; understanding that if George Washington was in New York he could communicate with Benjamin Franklin in Philadelphia by sending a written message; stating that early books were made by people using feather pens, ink, or paint and inscribing the books by hand; stating that the invention of the printing press changed the world by making it possible for people to make multiple copies of writings with greater speed and ease and for more people to read books; understanding that the telephone changed the world by enabling people to speak without being face to face; stating that babies learn to speak from being taught by older people; stating that babies will cry, whine, or use sound to draw attention when they lack the words to communicate their desires; saying that Alaskan natives have more words for snow than we do because they have more snow there and spend more time in it; understanding that deaf people can communicate using sign language or writing and that they can read lips; understanding that blind people can communicate verbally and can read Braille; being able to give good examples of words that we use today that didn't exist 50 years ago; understanding the basic steps taken by the post office in picking up and delivering a birthday card; having knowledge of what can be found in a newspaper and tending to read the newspaper themselves; knowing something about how newspapers are put together; knowing that radio brought drama and entertainment shows along with news and music; stating that television changed the world by allowing people to see in addition to hear the events being broadcast; being able to explain what a local television channel would have to do in order to include coverage of an astronaut speaking at a local school on their nightly news program; having some knowledge of why some television channels are free but others require paid subscriptions; understanding that companies pay television channels to broadcast their commercials, which are intended to entice viewers to buy their products or services; and understanding electronic mail works through computers and is faster than conventional mail. Throughout the rest of the report, when we indicate that a response category was part of the maturity set of responses to the interview as a whole, we mean that it tended to correlate positively, and often significantly, with the coding categories just identified.

Rare and Unique Responses

The following responses to Questions 1-3 involve interesting elaborations on the ideas represented by the coding categories or embody ideas that are not included in those categories. Most of these responses have been paraphrased to save space and focus on their key ideas, although occasionally rare or unique responses are quoted verbatim when it appeared worth doing so.

Question 1

Kindergarten: If you do something wrong; helping others.

First grade: A job; to explain something; like when one whale hears another whale singing and sings that same song back; helping others.

Second grade: You might have to travel to the person if you want to speak with them [one of several responses focusing on transportation]; working together [one of several responses focusing on cooperation]; traveling; defines community rather than communication.

Third grade: Talking on the phone; understanding each other; working together; radio.

Question 2A

Most responses to this question were well represented by the categories. The only exceptions worth noting were a kindergartener's statement that "in the old days before TV, they had to talk to each other" and a third grader's indication that people need to talk "when you're giving a speech."

Question 2B

Five students said that our lives would be worse if we couldn't talk because they would be "boring," and four others said that our lives would be worse because we couldn't talk on the telephone. Other rare and unique responses included the following.

Kindergarten: You wouldn't be able to say "no" if someone was hurting you; we would be deaf [two other students also had this confusion]; we would be both better and worse [couldn't explain].

First grade: You couldn't say things like "I love you, mommy/daddy;" it would be death.

Second grade: It would be boring and weird; it would be hard to send messages to other people.

Third grade: You couldn't tell the dentist what tooth to pull; you would be late for meetings and not know when Christmas was; you couldn't say please and thank you; you would always be having to write things and this would make a lot of work for "our postal service people."

Question 3

Some interesting misconceptions appeared here, including the ideas that dogs' thinking is verbally mediated and that barking is just as efficient a language for dogs as speech is for humans.

Kindergarten: If we turned dogs' language to ours and they turned ours into theirs, we would be a person with animal talk; talking is funner—it's like you really mean it.

First grade: They're the same because dogs talk in their heads and then talk to other dogs; it lets us communicate in ways that animals can't do; it's hard to hear what dogs say because they gotta bark the word; we can understand what dogs are saying, but they can't understand what we're saying; you can use language to teach dance steps; I can communicate to people all around the world [presumably via letters or technology], but dogs can't.

Second grade: We can laugh and they can't; talking allows us not to have to bark and strain our voices; talking is better because it is easier; people wouldn't want you to bark in their faces all the time; barking can't tell you anything; "if we just bark, it isn't good communication. But it would be for dogs because they know what's in their minds, so they know that the other dog is saying 'come over here' or something."

Third grade: Barking is the same as talking if you understand it; it would be annoying if we barked all the time; barking is hard to understand because it's making the same noise, but in talking you hear different words; we can move our mouths in all directions but dogs can only move theirs up and down [an interesting but incorrect attempt at physical explanation]; talking is better because we don't have to "do motions" [use pointing or pantomime] to be understood; we could communicate with dogs and cats if we taught them how to communicate with people.

Discussion

The students were generally aware that communication is a basic need, although this was not as clear and obvious to them as it was for food, clothing, and shelter. They recognized the need for communication most clearly with respect to emergency situations and situations in which there was a need to communicate information in order to learn or carry out a job. However, some students also noted the need for communication to interact with family members or express feelings or needs, and these students tended to suggest that life would be worse without communication because we would be lonely and isolated from others. More than a quarter of the students said that our lives would be worse if we couldn't talk because we would have to use sign language, read lips, or write messages. Some of these responses reflected the fact that certain students answered this question in terms of the plight of a few individuals suffering speech impediments (rather than in terms of subtracting speech from the human condition), but other students who gave this response were laboring under the misconception that lip reading and writing would have developed in humans even if they did not possess the ability to speak.

Although about a fifth of the students could not respond when asked why talking is better than barking, the students who did respond generally were able to communicate the idea that speech allows for much more subtle and differentiated communication than barking does. However, many of the students appeared to overestimate what goes on in the minds of dogs, assuming that their thoughts and attempts to communicate with one another are verbally mediated. The general levels of understanding here appear to progress from believing that dogs think and communicate just like humans except that they use a different "language," to not crediting dogs with verbally mediated thought but recognizing that dogs can communicate different "messages" through different forms of barking, to recognizing that although barking has some communication value, it is much more limited than language. Although a majority of the students either noted that talking is easier to understand than barking or that speech enables us to communicate more subtle and complicated messages than barking does, only two students (both third graders) connected this with the fact that human speech mechanisms allow us to produce a much greater variety of sounds and sound combinations in our speech than dogs can produce in their barking.

Communication Among Preliterate People

The next set of questions addressed the students' understanding that among preliterate people, communication is limited to the verbalizations that occur during face-to-face interactions and artistic renderings that do not include writing based on the alphabetic principle.

Question 4. Back in time, the earliest people lived in caves. How did these people communicate? . . . Did they have any other ways to communicate? [If the student did not mention speech, the interviewer asked if cave people could talk to each other. If the student did mention speech, the interviewer asked if there was ever a time when people did not have language and did not know how to talk to each other (and if so, how these people communicated)].

Question 5. Before Columbus discovered America, the only people who lived here were the Indians. How did the Indians communicate? . . . If the chief of one village wanted to get a message to the chief of a village five miles away, how would he do it?

Question 6. Did the Indians have libraries? . . . Why not? (If yes: **Tell me about the books that were in the Indians' libraries**). [If the student said that Indians did not have libraries but attributed this to lack of building construction materials or some reason other than lack of written language, the interviewer asked if the Indians had books (and if not, why not)].

Question 7. [If necessary, the interviewer prepared students for this question by explaining that Indians did not have libraries because they couldn't write their language, so they had no books.] **If the Indians couldn't write, how could they pass on what they had learned about hunting or farming?** (If necessary, ask: **Suppose that an Indian man was out hunting and found a new hunting ground. How could he communicate that to the rest of his tribe?**)

Only six students were unable to respond to the question about cave people. Of the rest, two-thirds (60) said that cave people communicated through speech just like people do today, although almost as many (57) said that there was a time when people did not have language. The latter response might or might not be considered accurate, depending on one's definition of "people."

Among students who said that cave people used spoken language, 13 went on to specify that they spoke in a different language than the one we use today, and another 10 specified that they had to have face-to-face communication because there were no telephones or mail then. In describing how cave people communicated in addition to or instead of using language, 39 students mentioned sign language or pantomime, 19 mentioned writing or drawing (typically envisioning artwork on cave walls or primitive maps or directions scratched on the ground), and 16 said that cave people grunted, growled, or made other vocal noises but did not communicate through speech.

The intention of the questions about Indians was to see if the students understood that Native Americans had oral but not written language. Probing was designed accordingly. For example, if the student said that the chief could communicate with the chief of a village five miles away by using smoke signals, the interviewer would ask what the chief would have to do if it were a rainy day. If the student mentioned shouting or beating drums, the interviewer would say that the second chief was too far away to hear this. If the student said that the chief would have to walk or ride to the other village, the interviewer would ask if he could get the message there without leaving his own village. In general, the interviewer would probe to see if the student understood that the chief would have to send someone to deliver the message personally at the other village. Similarly, probes for Question 7 were designed to see if the student understood that Native Americans did not have libraries for the fundamental reason that they did not have books because they did not have written language, as opposed to believing that they had books but not libraries because they lacked bricks or knowledge of how to construct large buildings.

Responses to Question 5A indicated that most students knew that Indians communicated by talking, although there was some variety in comments about the kinds of language used. Ten students were unable to respond to the question. Of the rest, 54 said that Indians spoke the way we speak today, 27 said that they spoke but in their own language, 21 said that they used hand signals or sign language instead of or in addition to speech, 12 mentioned artwork, carving on walls, or scratching on the ground, and 8 said that they communicated through whoops and hollers. Many of those who said that Indians spoke like we do today apparently assumed that they spoke English, although three thought they spoke Spanish and one said Algonquin.

The students had more difficulty with Question 5B, which asked about communicating with a person five miles away. Only a modest majority (56) of the students accurately stated that the chief would have to go personally to the other village or send someone to deliver the message verbally. Other students couldn't respond (24), thought that the chief could send someone with a written message (20), made reference to using the telephone, telegraph, tape recorder, or modern mail service (8), or mentioned smoke signals, drumming, or light flashes (7) or yelling (6).

When asked if Indians had libraries, two students said yes and another 18 didn't know. The other students all said no, but only 12 of them clearly stated that this was because Indians couldn't read or write. Another four students said that they didn't read (presumably by choice rather than because they lacked written language). Other responses were that libraries hadn't been invented yet or Indians didn't know about them (24), Indians didn't have books or access to books (18), they didn't construct big buildings such as schools or libraries (16), or there were no materials to build libraries or knowledge about how to build them (7).

Responses were not much better to the follow-up question about whether Indians had books, and if not, why not. This time, only 13 students said that they did not have books because they could not or did not read or write. Of the remaining students, 16 could not respond, 28 said that Indians did have books, 24 said that books weren't invented yet or Indians hadn't learned about them yet, and 11 said that they lacked the materials or knowledge to be able to make books.

Note that 28 students said that Indians had books, even though only two of them had said previously that they had libraries. This discrepancy occurred because about a fourth of the students believed either that Indians possessed only a few primitive and homemade books that were kept in the home for personal or family use or that they had books presumably comparable to today's books but lacked libraries because they lacked the knowledge or wherewithal needed to construct large buildings.

Responses to Question 7, asking how Indians could pass on something that they had learned, reflected the answers given previously to Question 5 (asking about how Indians communicated). That is, a majority of the students understood that Indians communicated through speech, so 54 of them said that they would pass on things that they had learned by telling or teaching people verbally. However, 30 students were unable to respond to this question, and the rest said that in addition to or instead of simply telling people, they would bring them to the newly discovered hunting ground to show them exactly where it was and how to get there (16), use visual representations such as planting a flag to mark the spot, marking trees along the route to provide visual guidance to fellow tribe members who wanted to go there, or drawing a map on the ground (14), or by using sign language or gestures (10). Among students who supplied the latter responses, some (perhaps 10) were under the impression that Indians were unable to communicate through spoken language. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

> 4. Um . . . they talked. (Did they have any other way to communicate?) Do this [makes grunting noises]. (Any other way?) No. (Was there ever a time when people didn't have language—when they didn't know how to talk?) Yes. (Well, how did people communicate then, when they couldn't talk?) I told you. (Oh, you mean by making grunts like that—making noises?) Yeah.
>
> 5. I don't know how. (Do you think they talked?) A little bit. (Now, if the Indian chief from one village wanted to get a message to a chief from another village five miles away, how could he do that?) Talk. (But the chief was five miles away.) Walk there. (Is there any other way he could get the message to the other chief?) No.

6. No. (Why not?) Because it was very old when they were alive. (OK, so it was early times. Did they have books?) No. (Could they write?) Yeah. (So they could write but they didn't have books. Is that right?) Yeah. (How come they didn't have books?) I don't know.

7. (pause) I don't know.

Kate

4. I don't know. (Do you think they talked with each other?) Yeah. (Is there any other way they could communicate?) Yeah. (How?) Like if they wanted to talk to other people and if they don't have telephones, they can go out of the cave and go find the people they want to talk to. (OK. Do you think there was ever a time when people didn't have language, when they didn't know how to talk to each other?) I don't know.

5. I don't know. (Do you think they talked to each other?) Yeah. (OK, do you think they had any other way to communicate?) No. (Suppose an Indian chief from a village wanted to get a message to the next chief five miles away. How could he do that?) He could tell one of the guys and if they see bad guys, they could shoot them. (OK, but how could he get the message to the next village?) I don't know.

6. No. (Why not?) Because they didn't live in a house yet. (OK. Did they have books?) No. (Why not?) I don't know.
7. I don't know.

First Grade

Chris

4. They growled at each other. (So you think they didn't talk?) Yeah. (Is there anything else they could do besides growl if they needed to communicate?) I don't know.

5. They said different words. (So they talked, but a different language. Any other way they communicated besides talking?) I don't know. (If an Indian chief back then who lived here in a village wanted to get a message to the chief in the next village five miles away, how could he do it?) He would . . . he would send one of his men to go tell him.

6. No. (They didn't. Do you know why they didn't?) Because they didn't know what a library was. (Did they have books?) No. (Why not?) Because they . . . they didn't know if there would be a book to read or not. (They didn't know about books?) No.

7. I don't know. (Well, if an Indian man went out and found a new hunting ground, was there some way he could let the rest of the tribe know about that?) He could go back and tell them.

Lauren

4. By . . . maybe by acting out something, or they might even do things like making noises. (Did they have any other way to communicate?) I don't think so. (Could cave people talk to each other?) No, cause they couldn't talk, but I think they could talk to each other. (Was there ever a time when people didn't have a language—when they didn't know how to talk to each other?) They would maybe write messages. (Was there a time when they didn't have language and they didn't know how to talk to each other?) No.

5. They took wood bark and they would write . . . and write pictures and then they might understand what they were saying. (If the chief of one village wanted to get a message to the chief of another village five miles away, how would he do it?) He would write on bark and send it, and then he would . . . if they had a river by there, they would like canoe there, for five miles with the message and give it to them and then go back. . . (Why didn't he just talk?) Because Indians don't know how to talk that good—they never learned how to talk, I don't think. They couldn't talk.

6. No. (Why not?) Because libraries weren't made. (Did the Indians have books?) Probably no. (Why not?) Cause I don't think books were made then.

7. Um . . . maybe they could . . . I don't really know. (Well, suppose an Indian man was out hunting and found a new hunting ground. How could he communicate that to the rest of his tribe?) . . . I don't know.

Second Grade

Mark

4. They used to like tell stories, just talk to each other. (Do you think there was ever a time when people didn't have language—when they couldn't talk to each other?) No.

5. Tell stories and like just talk to each other. They just played and talked to each other. (If the chief of one Indian village wanted to get a message to the chief of a village five miles away, how could he do that?) Hm . . . probably, well, if they didn't have anything, he would probably just walk. (What do you mean "didn't have anything?" Like what?) Like you couldn't have a phone, you couldn't like send a message, unless Columbus was there and they could like get in their boat and then go over.

6. No. (How come?) Well, maybe they did. (What do you think?) They didn't have books, so probably no.

7. Talk.

Emily

4. I don't know. (Could cave people talk to each other?) Yeah. (Was there ever a time when people didn't have language—when they didn't know how to talk to each other?) Yeah. (Well, how did those people communicate?) They do sign language or something.

5. They talked to each other. (If the chief of one village wanted to get a message to the chief of a village five miles away, how would he do it?) They walk or ride horses. (What if he wanted to stay home but he wanted the message to get to the other chief—what would he do?) I don't know.

6. No. (Why not?) Because they didn't have buildings like that. (Did the Indians have books?) Yeah. (What sort of books?) I don't know.

7. I don't know. (Suppose an Indian man was out hunting and found a new hunting ground. How could he communicate that to the rest of the tribe?) I don't know.

Third Grade

Dale

4. By talking. (Any other way?) Sign language. (Do you think there was ever a time when people didn't have language—when they couldn't talk to each other?) Yeah. (Well, way back then when they couldn't talk, how did they communicate, do you think?) With their hands.

5. I don't know. (Do you think they talked to each other?) Yeah. (Do you think they communicated any other way, besides talking?) Sign language. (Back then, if the Indian chief from one village wanted to get a message to another chief in a village five miles way, how could he do that?) Ride a horse over there with his message. (Was there some way he could get a message to him without having to go there himself?) No.

6. No. (How come?) Cause there weren't any books back then. (How come there weren't any books?) Cause no one had any paper to write on and make a book.

7. Tell them. (Is there any other way they could pass on their learning?) Showing them something they found.

Chelsea

4. By drawing stuff on walls, and when we find it now, it's still there. (Did they have any other ways to communicate?) Probably by jumping up and down and yelling at each other. (So could cave people talk to each other?) Yeah. (Was there ever a time when people didn't have language—when they didn't know how to talk to each other?) I don't think so, except for maybe deaf people that can't hear and can't talk.

5. Probably by showing them what they would do if they wanted them to do something. (No, among themselves. How did they communicate?) Oh. (For example, if the chief of

one village wanted to get a message to the chief of a village five miles away, how would he do it?) He'd probably send a courier to take the message. They'd probably tell the person, but if the other person couldn't understand him, he'd have to go back and tell him he has to say it in a different way, but if he couldn't, then he couldn't send the message.

6. No, they weren't invented yet. (Did the Indians have books?) No, they probably just got it from their minds. (Why didn't they have books?) Because nobody had been an author yet and they didn't have pencils or anything. They just used rocks and drawings and stuff, and they didn't know how to make letters.

7. Probably by showing them what they did on the walls or showing them and going like that—"You did a great job"—and stuff. (So they'd show them with arm movements?) Yeah, and then like a happy face or something to tell them that they had a good time and did all that stuff right. (Well, for example, suppose that an Indian man was out hunting and found a new hunting ground where there were lots of animals. How could he communicate that to the rest of the tribe?) Probably show them that he found a big area with lots of animals all over, and he'd show them it was a hunting place where you can hunt and stuff—for animals.

Grade Level Differences

Analyses of the categories for responses to Question 4 indicated that younger students were more likely to be unable to talk about how cave people communicated, whereas older students were more likely to mention sign language/pantomime or drawing on walls or the ground. Concerning Question 5A, younger students were more likely to be unable to respond or to say that Indians talked among themselves like people talk today, whereas older students were more likely to say that they spoke in their own language, that they used hand signals or sign language, or that they carved on walls or drew on the ground. Concerning Question 5B, younger students were more likely to be unable to respond and older students more likely to state correctly that the chief would have to go personally or send someone to the next village to deliver the message in face-to-face interaction.

There was also a significant nonlinear relationship for speaking of sending someone to carry a written message to the village. This incorrect response was given by nine first graders but only two kindergarteners, five second graders, and four third graders. It is probably best viewed in connection with the "don't know" responses, which appeared far more frequently among kindergarteners than other students. Taken together, these two sets of data suggest that among students who did not understand that the chief would have to go personally or send someone to deliver a message face to face, kindergarten students were more likely to have no idea and thus to say "I don't know," whereas some of the first graders guessed (incorrectly) that the chief might send someone with a written message.

Concerning Question 6A, younger students were more likely to be unable to respond, whereas older students were more likely to say that Indians did not have libraries because they had not been invented yet or Indians didn't know about them yet, or to say that they did not have libraries because they did not have books or access to books. There was a nonlinear relationship for stating that Indians did not have libraries because they did not construct large buildings. Concerning Question 6B, younger students were more likely to be unable to respond to the question and older students more likely to say that Indians did not have books because they lacked the knowledge or materials needed to make them. There was also a nonlinear relationship for the statement that books had not yet been invented or that Indians hadn't learned about them yet. Finally, analyses of responses to Question 7 indicated that younger students were more likely to be unable to answer the question but older students were more likely to say that Indians could communicate something they had learned by telling it or teaching it verbally, and in the case of a newly discovered hunting ground, by bringing tribe members to the spot or using visual representations to mark the spot or the path to be followed to get to it.

In general, analyses of responses to Questions 4-7 indicated that knowledge about communication in preliterate societies increased with grade level. Younger students were more likely to be unable to respond to the questions or to offer incorrect guesses, whereas older students were more likely to respond with accurate statements. However, it was surprising that there was no significant relationship with grade level for responses indicating that Indians couldn't or didn't read or write (Questions 6A and 6B) or the statement that Indians had books (6B). We do not know why the second- and third graders were no more likely than the kindergarteners and first graders to know that Indians lacked books because they lacked written language. However, we have a hypothesis to suggest, based on previous findings about the transformations that elementary students' thinking about Indians undergoes as it progresses from the negative and stereotyped views held in kindergarten to the more realistic and empathetic views expressed as fifth graders (Brophy, 1999).

Students tend to come to kindergarten possessing either no knowledge about Indians or cartoon-like stereotypes of their appearance or behavior (tipis, feathers, bows and arrows, dancing around campfires, warlike tendencies) picked up from cartoons and movies. However, as they are exposed to traditional First Thanksgiving instruction in kindergarten and first grade, they begin to understand that Indians were actual people (the first people in America) and to develop respect for them as knowledgeable wilderness survivors and teachers of the Pilgrims and other early-arriving Europeans. Furthermore, as they progress through the primary grades and experience instructional units on Native Americans that include extended study of the lives and cultures of representative tribes or tribal groups (eastern woodlands, great plains, Pacific northwest, etc.), they typically develop considerable empathy with Native Americans and even come to view them as noble ecologists and victims of European aggression and greed. The sympathetic views of Native Americans to which most primary-grade students are exposed do not include claims that these tribes were literate or possessed books (although they may include

BEST COPY AVAILABLE

mention that some of their languages later were rendered into written forms). However, in the process of learning many positive things about the Indians they study and developing noteworthy empathy with and respect for them, many second and third graders may come to assume that Indians were literate and wrote books (or at least, develop this assumption if the question is raised with them, as it was by our interviewers). In any case, whatever the reason, our data indicate that the older students were no more likely than the younger ones to know that Indians did not have books because they did not have written language.

Achievement Level and Gender Differences

Analyses for categories of response to Questions 4-7 revealed only three significant relationships with achievement level and four with gender. Lower achievers were more likely than higher achievers to be unable to respond to Question 7, whereas higher achievers were more likely than lower achievers to respond to Question 5B by saying that the chief would have to go personally or send someone to deliver a verbal message to the next village or by saying that the chief might try to convey the message by yelling it very loudly. The first two of these responses might have been expected as part of the general tendency for higher achievers to be more able to respond to our questions and to give more sophisticated responses when they do. The third difference is surprising because the notion of attempting to deliver a message across five miles by yelling is a low-level response. It is understandable, however, by juxtaposing it with an almost-significant tendency for lower achievers to be more likely than higher achievers to be unable to respond to the question. Occasionally it happens that a relatively low-level response shows a positive relationship with achievement level (or even grade level) because it represents a good guess for K-3 students and thus constitutes a better response to the question than failure to respond at all or communication of a still lower-level response. We believe that the achievement level difference for the "yelling" response is one of those instances. In any case, the most important finding concerning achievement level relationships in this set of analyses is that surprisingly few significant relationships appeared. Higher achievers were not systematically better informed than lower achievers about communication among preliterate people.

The gender differences all involved categories for responses to Question 4. When asked how cave people communicated, boys were more likely than girls to say that they spoke just as we speak today, whereas girls were more likely than boys to say that they spoke in a different language, that they used sign language or pantomime, or that they wrote or drew on cave walls, rocks, or the ground. Thus, the girls displayed more detailed and accurate knowledge about communication among cave people than the boys did. It is tempting to interpret this as part of a more general tendency for girls to know more about language use and personal expression than boys, especially given that our previous interviews about shelter, clothing, and food showed no systematic gender difference in knowledge about the distant past. However, the analyses for responses to Questions 5-7 showed no parallel tendency for girls to know more than boys about communication among preliterate Native American tribes. Thus, the noteworthy gender differences in responses to Question 4 seem better understood as surprising anomalies than as parts of a larger pattern that might have been predicted.

Relationships Among Response Categories

Students who talked about cave people using sign language were more likely than other students to talk about Indians using sign language. Later in the interview, these students were also more likely than other students to mention sign language when asked if people can communicate with each other if they don't speak the same language.

Students who talked about cave people drawing on walls or the ground were more likely than other students to talk about Indians drawing on walls or the ground.

Students who answered question 5B by saying that the chief would have to go personally or send someone to the village with a verbal message were more likely than other students to say later in the interview that Indians could pass on what they learned by showing people, bringing them to the spot, or telling them; that writing changed the world by eliminating the need for people to be face to face in order to communicate; that Washington in New York could communicate with Franklin in Philadelphia by sending him a written message; and that the telephone changed the world by enabling us to talk to people without having to travel for a face-to-face meeting with them. These responses all indicate good knowledge about what forms of communication were possible given what inventions were and were not available, and they tend to correlate with the maturity set of responses to the interview as a whole.

Students who answered Question 6A by saying that Indians didn't have libraries because they hadn't been invented yet or Indians hadn't heard about them yet were more likely than other students to make the same response to Question 6B in explaining why Indians didn't have books. Similarly, students who answered Question 6A by saying that Indians couldn't or didn't read or write tended to make the same response to Question 6B. These students also were more likely than other students to later say that the invention of writing changed the world because it enabled people to read.

Students who said that Indians didn't have libraries because they didn't construct big buildings were more likely than other students to say that they didn't have books because they didn't have schools, libraries, or bookstores. Also, students who said that Indians didn't have libraries because they didn't have books were more likely than other students to say that they didn't have books because they didn't have the knowledge or materials needed to make them.

Students who said that Indians could pass on what they had learned by telling it or teaching it verbally were more likely than other students to have said that people need to talk in order to communicate or understand feelings or needs; that talking is better than barking because we can communicate more or more complex things and express emotions or plans; and that an Indian chief would communicate with a chief in a village five miles away by going to see him personally or sending someone to deliver a message verbally. These responses seem to have in common an awareness of the importance of speech for communicating important, affectively tinged content. Finally, the categories in this set that showed the strongest positive relationships with grade level also tended to correlate with the maturity set of responses for the interview as a whole.

Rare and Unique Responses

Question 4

Kindergarten: Telephones—cell phones; they couldn't talk or communicate in any way.

First grade: They communicated just like monkeys; when the "first man who stepped on the earth" arrived, he taught the others how to talk, and after that, everyone could talk [semi-magical explanation for how humans acquired speech].

BEST COPY AVAILABLE

Second grade: They communicated like animals do, with smells or something; they chipped letters into wood or rock.

Third grade: They used drums or something to make noises; they would jump up and down and yell at each other; they would make noises with drums or things; "they could have written letters down in the dirt with a stick and then that person could have read it and wrote back an answer or something."

Question 5A

There were no rare or unique responses worth reporting for kindergarteners or first graders, except for the statement by several students that Indians couldn't talk.

Second grade: They used American sign language; they would make paper and write messages; they used signs when sneaking up on buffalo [so they wouldn't have to make noise talking].

Third grade: They painted pictures on animal skins; they communicated by giving gifts [potlatch]; telegraph; drums and smoke signals. In addition, three third graders said that Indians spoke a "weird" language.

Question 5B

References to writing in responses to Question 5 tended to refer to carving on walls, scratching signs on the ground, or other pictographic representations rather than written language. Two first graders are quoted at length to show interesting mixtures of correct and incorrect ideas.

Kindergarten: Drive to the other village in his car to deliver the message; shoot the message over to the other village using a bow and arrow; "they would cut down a tree, make paper, and get a feather to write it—oh yeah, they didn't have mail back in those days."

First grade: "He could get a piece of like buffalo skin and write a message down, like pictures of what to say to him. Another person could ride a horse there and give it to him and ride back . . . he would write a message like, "Are you gonna be here on Monday?" . . . If I had a pen and a piece of paper, I could show you that I know that kind of Indian because I could show you how they would write letters. (Just tell me how you would do it.) I think they'd have to make an X for an E, and if they wanted an A, they'd have to go like a circle around and put an X." [This student began talking about pictographs but ended up talking about writing words].

"They took wood bark and they would write pictures and then they might understand what they were saying. He would write on bark and send it, and then if they had like a river by there, he would take a canoe there, for five miles, with the message and give it to them and then go back. (So the chief would take his own message to the next village?) Yeah. (Why didn't he just talk?) Because Indians don't know how to talk that good—they never learned how to talk, I don't think."

Second grade: He would make paper, make a pencil, and then send a message [Note that in the last two quotes, Indians are credited with considerable skills of all kinds but not oral language]; "he would write a message—No! They didn't have pencils back then."

Third grade: Maybe they had tape recorders then; he would shoot an arrow over there as a signal; maybe he would make wolf calls real loud, or else use a whistle.

Question 6A

Kindergarten: None.

First grade: They didn't know what a library was; they didn't know how to make drawers very good—drawers for books; they didn't have paint to paint the library.

Second grade: They had libraries but they had to build them themselves [apparently thinking of a small room in a home or a small wooden communal library]; they were home schooled, so they didn’t read books—they just talked.

Third grade: They didn’t need libraries because they had “ways of knowing things;” there weren’t a lot of trees to make paper and books back then.

Question 6B

Kindergarten: Says that Indians could write but didn’t have books because they lacked the means to make them; Indians couldn’t write because they had no pencils or crayons [reversed reasoning]; they had books but no libraries—they bought books at stores.

First grade: They had books that they carved from wood; they didn’t have stores or money to buy books; they had books but only small ones.

“They didn’t have libraries because Pilgrims took many Indians and they didn’t have lots of them left, so they couldn’t make tons of books. Also, they couldn’t fit a lot of books in just a tipi. Tipis couldn’t be libraries and they didn’t have big enough places. (Did they have books?) Yes, but it was hard because it was just made out of buffalo skin because if they made a mistake, they didn’t have erasers, so they had to keep on getting buffalo.” [This is an example of the earlier mentioned tendency for primary-grade students to empathize with Indians as wilderness survivors and victims of European exploitation.]

Second grade: They had recipe books for cooking animals; they had books made from wood using special tools; how could they have books if they didn’t have printers or pencils or paper—that’s probably why they couldn’t write a note to someone.

The following second grader is quoted for her good answer that nevertheless lacked awareness that Indians couldn’t read: “There weren’t very many books back then, probably no books. They didn't build anything like schools yet. They might have had a few little play schools, you know what I mean, but they didn't have big schools like this one. They didn't have electronics. (Did they have books?) No, because they didn't know how to make paper and they didn't have pens. They could have wrote with berry juices, but they didn't have any paper."

Third grade: Indians didn't use books because most books are in English and they didn't read English; their books were leather—buffalo skin; if they had books, they had to make them themselves.

Question 7

Most responses to this question are well represented by the coding categories. Among those who talked about passing on learning through talking or teaching, only five noted that the teaching would be passed on through generations.

Kindergarten: He could build a library; he could get some paper and show them [i.e., through drawing].

First grade: By the Pilgrims; go to someone who knew how to write and get it written; put a new flag up [presumably referring to the flags planted by explorers to claim land for their nations].

Second grade: None.

Third grade: "Memorize it. Write it in a book. Maybe when the chief was born, they didn't have books, and then maybe somebody found a book and he started writing in it." [semi-magical explanation for acquisition of writing by Native Americans].

Discussion

The students' responses to Questions 4-7 indicated mixed and spotty knowledge of communication among preliterate people. Majorities of the students understood that cave people and Native Americans communicated through spoken language, although only minorities of them seemed aware that the languages spoken by these people were very different from contemporary American English. Some students thought that cave people lacked speech, and a few even thought that this was true of Native Americans as well. Some students also made reference to sign language or visual representations used by these people, and most seemed to understand that these representations were limited to primitive artwork, pictographs, and simple maps. However, a few students thought that the writing that they did on walls or the ground (or on bark, etc.) involved language (i.e., words spelled using an alphabet). Similarly, a few of the students who mentioned sign language seemed to think that the sign language used then was the same sign language used today (e.g., American sign language).

A few students (surprisingly few, given earlier research) talked about whoops and hollers or gave other evidence of the "wild Indian" stereotype that many children bring to school. At the other extreme, a few clearly had developed great empathy with Indians and communicated the "wilderness survivor" and "victim of European exploitation" images.

Many of the students, including many of those who understood that Indians did not have books or libraries, did not clearly understand that they lacked written language. These students thought that Indians could have engaged in reading or writing if they had wanted to (but they didn't because their interests lay elsewhere). Or if they couldn't, this was not because they lacked the alphabetic principle but because they lacked writing materials, paper, or the knowledge and wherewithal to make books or build libraries. Only minorities of the students understood that Indians spoke their own tribal languages and that these languages were spoken but not written, so that learning had to be communicated, retained, and transmitted primarily through verbal interaction.

In the process of responding to this set of questions, the students communicated various misconceptions: Cave people or Native Americans could not talk; they acquired speech (and later, writing) because it was taught to them by a single individual who somehow knew it or discovered it; the impressions that they made on wood, rock, or dirt included letters and words; they made their own paper from wood and books from buffalo hide; they had books but not libraries; they had access to modern inventions such as cars, telephones, or tape recorders; and they couldn't make many books because exploitation by the Pilgrims left them too depleted. In addition, some students communicated ideas that were incorrect but indicated good thinking (Native American books included recipes for cooking animals) or transitions toward more complete understanding of pre-literacy (Indians didn't read English).

The Invention of Writing

The next two questions addressed students' appreciation for writing as a fundamental, world-changing invention. Question 8 asked them directly about how writing changed the world, and Question 9 paralleled Question 5B by asking (indirectly) how communication across distances could be accomplished once writing had been invented.

Question 8. For a long time, people could speak but they couldn't write. Then alphabets and writing were invented. How did the invention of writing change the world? . . . What did writing bring people that they didn't have before?

Question 9. Let's think about communication in the time of George Washington. If George Washington was in New York and he wanted to send a message to Benjamin

Franklin in Philadelphia, how could he do it? (If the student correctly says that Washington would write a letter, ask how he would get it to Franklin. If the student says that he would mail it, ask: **Did they have mail back then like we do now? . . . So what would he have to do to get the message to Philadelphia?**)

More than a third (37) of the students could not answer Question 8 or could only say that after writing was invented, people could write, spell, do ABCs, etc. The remaining students gave one or more of the following responses: People could send written messages or letters (26), learning became easier or enhanced because it became easier to pass on information (20), people now had an alternative or better way to communicate, including making it easier for people who couldn't speak or hear (19), people now began to have books or libraries (18), people no longer had to be face to face in order to communicate (17), people started using or needing pens, ink, and paper (10), and people could begin to read (7). These responses were all valid as far as they went, although they varied in quality as statements about how the invention of writing changed the world.

The students were less successful answering Question 9, partly because many of them were unclear about which inventions were and were not available to Washington and Franklin. Fifteen students were unable to respond to the question, and of the rest, 22 referred to communication devices that had not been invented at the time (telephone, telegraph, fax, computer) and 16 referred to modern forms of transportation that might be used to travel to Philadelphia (train, car, bus, plane). The remaining responses included the idea that Washington would have to go and visit Franklin, or vice versa (35), someone would be sent with a written message (recognizing that today's mail system wasn't in place) (34), that Washington would write the message and then put it in the mail, like we do today (28), that a messenger would travel to Philadelphia by horseback or wagon (12), and that the message would be sent by water via ship or bottle (7). Thus, fewer than half of the students understood that Washington could send Franklin a written message, and many of these students thought that the message would be sent using the modern postal system or modern communication devices, or that the message would be carried by a person who traveled using modern transportation methods. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

8. It was different. (How?) I don't know.

9. I don't know. Send a message? (How could he send a message?) Take it to him. (Is there some other way he could get him a message?) I don't know.

Kate

8. I don't know. (Did writing enable people to do something they couldn't do before?) Yeah. (What?) They could speak other people's languages. We have to teach them, or they could teach us their language.

9. I don't know.

First Grade

Chris

8. They didn't have to walk to go tell the other person what they wanted to know. (Because they could what?) They could write.

9. I don't know.

Lauren

8. It changed it cause there's letters and they didn't know what letters were before. (So what did writing bring people that they didn't have before?) It brang them so they could write . . . I don't really know.

9. Maybe he could . . . maybe he could like send it to him somehow, but I just don't know how he sent it to him. (How could he do that?) I don't really know.

Second Grade

Mark

8. More happier, because someone could like ask you how to spell something, and you could say "I don't know," and if you do, you could like spell it and you'd be like, "Fine." Then you could spell it. (OK, so people learned how to spell words and so on. Did being able to write make a difference in other ways or change the world somehow?) Yeah, because like they couldn't write, so how could they write messages? Like if you had a birthday, how could you write messages like "Come to my birthday party" and like that?

9. Send a message or talk on the phone. (Did he have a phone?) . . . Probably not, so he couldn't talk on the phone, so he could send messages. (OK, he could send a message. How would he get it to Philadelphia?) Um . . . sail, like sail on a ship. (Would he do it or would somebody else do it , or what?) He would probably ask somebody if he didn't want to. (So he would have to ask somebody to get the message to him, and you think it might have to go on a ship or something?) Yeah. (OK. So you don't think they had a post office then like we have now?) Yeah, they didn't.

Emily

8. I don' t know.

9. He can like ride down and mail it. [i.e., put it in Ben's mailbox]. (Was the mail then like it is today?) I don't know.

Third Grade

Dale

8. It changed the world so people could write to each other. (Was that important for some reason?) Yeah. (Why?) So they could get books and read them and get smart.

9. Use one of those things where you push your thumbs down, and they kind of go like through wires or something. (Oh, you mean like a telegraph?) Yeah. (That's an interesting idea, but they didn't have telegraphs then.) They could send someone on a horse. (OK, you could send someone on a horse . . . with what?) With the message he wrote.

Chelsea

8. Because you didn't have to draw pictures anymore to communicate. You got to use pencils and got to write like we do now, like writing letters. (But how is it different?) You don't have to draw pictures or you don't have to do motions. (So what did writing bring people that they didn't have before?) Probably they . . . that's hard. Probably they think it's better to write now with letters than drawing pictures and doing motions, cause that'd be kind of hard when you're trying to think or trying to do something, like you grew something—a crop. It'd be hard to show them what it was because probably some of the cave men wouldn't know what it is.

9. He'd probably have this map kind of paper that's like cloth, and he'd have a quilled pen that has a feather, and he'd probably write it down, but I don't know if he went to school or not. (Say if he wrote it down, what would he do then to get that message to Ben Franklin?) He'd probably find one of his secretaries, if he had one, and tell them to take it to Benjamin and give it to him and tell him that it's from him—George Washington.

Grade Level Differences

For both Questions 8 and 9, the younger students were more likely to be unable to answer the questions and the older students were more likely to supply the most sophisticated responses. Older students were more likely to say that the invention of writing provided people with an alternative way to communicate, that it made it easier to learn and pass on information, that people could now send written messages or letters, that they could begin to read, and that they no longer had to be face to face in order to communicate. They also were more likely to recognize that Washington would have been able to send a written message to Franklin (although that message would have to be taken through some mechanism that did not include today's mail system, such as a messenger traveling by horseback or wagon). There was also one nonlinear relationship with grade level: First and second graders were more likely than kindergarteners or third graders to suggest that Washington's letter would be mailed much the same way as letters are mailed today. This nonlinear relationship is surprising only in that the kindergarteners did not make it more frequently. It is not surprising that the third graders tended not to make this response, because they tended to make the better alternative response that the message would be taken by one of Washington's staff people or some other courier, but not the present-day U.S. mail service.

Achievement Level and Gender Differences

The categories for responses to Questions 8 and 9 yielded four significant relationships with achievement level and one with gender. Lower achievers were more likely than other students to be unable to respond to Question 8 and to suggest (incorrectly) that modern transportation methods would have been used to convey Washington's message to Franklin. Higher and average achievers were more likely than lower achievers to say that people no longer had to be face to face in order to communicate after the invention of writing. The fourth achievement level relationship was nonlinear: Average achievers were less likely than lower or higher achievers to suggest that Washington's message would have been mailed much like letters are mailed today.

The lone gender difference indicated that nine boys but only three girls suggested that the courier taking Washington's message would travel by horseback or wagon. This difference was unexpected and we have no interpretation for it.

Relationships Among Response Categories

Students who said that the invention of writing changed the world because people started using or needing pens, ink, and paper were more likely than other students to answer a later question by saying that people who don't speak the same language can communicate with each other by writing down what they want to say (not realizing that the other person could not read in the language that the message was written).

Students who said that the invention of writing made it possible for people to communicate without being face to face were more likely than other students to have said that an Indian chief would have to go personally or send someone to deliver a verbal message to a village five miles away, that the invention of writing enabled people to send written messages or letters, that Washington would send a written message to Franklin, and that the telephone changed the world by enabling people to communicate across distances without having to write letters. These students showed good awareness of the effects of inventions, and these responses were part of the maturity set of responses to the interview as a whole. In addition, categories for responses to Questions 8 and 9 that showed strong positive relationships with grade level also correlated with the maturity set of responses to the interview as a whole.

Rare and Unique Responses

Question 8

Most responses are well described by the categories. There were only a few rare and unique responses:

Kindergarten: People could learn other people's languages more easily.

First grade: Bookstores; typing.

Second grade: Pens were created in 1919; writing was invented for deaf people who couldn't communicate by talking.

Third grade: People could learn other languages easier.

Question 9

Kindergarten: None.

First grade: Student describes old-fashioned telephones, thinking that they were in existence then; use a sign or something, like shoot a cannon; write the message on a cannonball and shoot it there; put it in a bottle in the ocean.

The following response is quoted at length as an example of reasoning from a limited knowledge base: "He could make paper, or if there were any stores around there, he could buy paper, get a pencil, look around there and see all those letters, like sound them out and then go to a dictionary and look them up and write them. (But how could he get the message to Ben Franklin?) He could probably write it and then if he had a mailbox he could put it in there, and then the mail man would come and if there's a car he can do that and if there isn't, he could probably walk or run. (Did they have mail back then like we do now?) Probably not, because it's been like a thousand years or so. (So what would he have to do?) If he had a phone, he could call and say, 'If you're home, there's going to be a message in your mailbox or on the doorstep.'"

Second grade: They had mailboxes but no U.S. mail, so a person taking the message there by horseback would put it in the mailbox; there weren't any cars then, so there wouldn't be any mailboxes either; they didn't have mailboxes but they had mail carriers on bicycles [also says that the computer predated airplanes, copiers, and schools—that it was just about the first thing invented]; he would send it with a mailman, but it would take a long time to get there.

Third grade: Tell a slave to take the message; he could have blown a horn [as a signal]; put the message in a bottle and float it; go to the Pony Express office and send the message that way.

The following third grader reasoned through to an improved response: "He could write the message and mail it, but I don't know if mail was invented then. (You're right, they didn't have the kind of mail we have today. So what do you think he would have done in those days?) I don't know if they really used to put it in a bottle and send it with the ocean, but it would be hard to get it because it could get to somebody else. (That's right, so do you think there was some way he could get a message to Ben?) Phone, but they didn't have a phone back then. Maybe he could go there himself. (That's true, but was there a way to get a message to Philadelphia without going there himself?) I don't know."

The following is quoted as a noteworthy good answer: "Well, they had horses back then. He had to write a note, send it like in the mail, and give it to Benjamin Franklin. (Did they have mail back then like we do now?) No, they didn't have holders [mailboxes], they didn't have trucks, vans, or post office things. (So what would he have to do?) Give it to a man on a horse that's like a mail person and tell him to ride it to Philadelphia."

Discussion

About half of the students couldn't explain why writing was a basic invention that changed the world (beyond noting that people began to write or started using pens, ink, and paper). However, the other half provided responses that were valid as far as they went and sometimes included good insights (such as that writing made it possible to communicate across distances, facilitated learning, and made it easier for people who couldn't speak or hear to communicate with others). Furthermore, their responses were almost completely free of misconceptions, except for the student who believed that writing had been invented specifically as an enabling mechanism for deaf people. Perhaps good responses to this question should not be surprising because all of the students were familiar with writing from experiences at home and at school and because the preceding Questions 5-7 had already given them opportunities to consider some of the functions that writing fulfills in human communication.

Responses to Question 9 were less impressive and often included misconceptions because the students frequently were unclear about when Washington and Franklin lived and which inventions were and were not available at that time. Consequently, some students thought that Washington and Franklin could communicate only through face-to-face interactions, but others thought that they could use communication or transportation devices that were not invented until much later. Thus, fewer than half understood that Washington could send Franklin a written message, and only about a third understood that the message delivery services available to Washington were a far cry from today's U.S. postal service. A few interesting misconceptions appeared, such as the notion that people had mail boxes outside their houses then even though there was no regular mail service, the notion that the Pony Express operated between eastern seaboard cities, and the notion that because there were no cars in Washington's day, there were no mail boxes either (in this suburban student's experience, mail boxes are placed at the curb and accessed from a vehicle—he was unaware that urban mail boxes are placed just outside or inside the building entrance and are accessed by mail carriers traveling on foot).

Overall, there was considerable variation among the students in the degree to which they understood the invention of writing as fundamental and in the degree to which they could apply this understanding by contrasting the distance communication options available to George Washington with the options available to a preliterate Native American tribal chief. Fewer than one-fourth of the kindergarteners were able to address these questions effectively, whereas more than three-fourths of the third graders answered them insightfully.

Inventions of the Printing Press and Telephone

The invention of the printing press made it possible to set text in print and mass produce copies of it, and the invention of the telephone made it possible for people to carry on conversations directly without being face to face or having to exchange letters. The next three questions assessed the students' awareness of the import of these inventions.

Question 10. Think about the very first books that were ever made. What do you think those first books looked like? . . . When the people made those first books, how did they make them?

Question 11. For a long time, anything that was put down on paper had to be written by hand—even books. Then, the printing press was invented, and people could print newspapers and books, like we have today. How did that invention of the printing press change the world? . . . What did printing bring people that they didn't have before?

Question 12. Another important invention was the telephone. How did the telephone change the world? . . . What did the telephone allow people to do that they couldn't do before?

The students produced quite a range of responses to Question 10. Nineteen of them couldn't respond and another nine answered (at least initially) not by describing how the earliest books looked at the time but instead how they might look today (old, tattered, torn, dusty, etc.). Responses that spoke more directly to the question included: the people who made the first books wrote or drew pictures themselves (42), they used paper (26), they used feather pens, ink, or paint (19), they used pens, pencils, markers, or crayons (14), the books had no color and no or few pictures (14), and the books were made out of wood, bark, or cardboard (14). In addition, there was an unusually high number of "other" responses that did not fit into the previously described categories (36), such as that the books were carved rather than printed or that they were written by hand. Although this set of responses included some internal contradictions (e.g., early books contained no color or illustrations vs. they were colored or illustrated using crayons, paint, etc.), most of the students did have the general idea that early books featured text written in longhand on paper that was rougher or otherwise more primitive than what is used today.

More than a third (35) of the students were unable to say how the invention of the printing press changed the world. The remaining students generally supplied responses that were valid as far as they went, although some were more satisfactory than others because they showed awareness of the implications of mass production of printed materials, not just awareness that the printing press made book production less laborious for the people who produced the books. No single response was made by even one-fourth of the students, but several responses appeared commonly: the printing press allowed people to produce books without having to write in longhand and get their hands tired (22), they could work more quickly or not have as much work to do (18), books began appearing in typeface instead of cursive writing (18), people could make multiple copies of things with greater speed or ease (14), pictures and color were introduced or made easier to include (9), printed materials were easier to read because print is easier to read than cursive writing and is more permanent and less likely to be smeared than handwritten text (8), and more books were made accessible to many more people (8).

Only nine students were unable to say anything about how the invention of the telephone changed the world. Almost half (45) noted that the telephone made it possible to converse without being face to face, 33 said that people could now communicate across distances without having to write letters, 18 said that people could call or talk to one another, without elaborating why this was better than before, and 6 made responses that didn't fit into the other categories (e.g., people could make plans more easily, call to see if someone was home before visiting them, or call to order pizza). The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

10. I don't know because I never saw them.

11. Yeah, because they print like a computer. (So how did this change the world?) I don't know.

12. I don't know.

Kate

10. I don't know. (The people who made those first books—how do you think they might have made them?) They made them cause they maked up a story and then they wrote it down in books and they putted it in libraries or in stores.
11. I don't know.

12. Because they decided to do a telephone so they can call people and stuff without walking over.

First Grade

Chris

10. A little bit like the books now. (When the people made those first books, how do you think they made them?) They wrote them. (With their hands?) No, with a pencil or a pen.

11. They didn't have to use their hands to write it. (That's right. What else, though? Did printing bring people something they didn't have before?) They had a machine that printed out books. (OK, why was that good?) I don't know.

12. They could talk to each other from a long far away.

Lauren

10. They looked brand new and . . . and they didn't have any tears or . . . they were big books with lots of pages. (When the people made those first books, how did they make them?) I do not know.

11. They could write books and a long time ago, they wouldn't take long because they could print it out. (So why is that different?) Because the other ones were wrote by hand, but the other ones were a little neater than the other ones. (OK, so they were neater. Is there any other way that the invention of the printing press changed the world?) It changed because we didn't have to use a pencil or we wouldn't have to erase anything.

12. It changed it and they can call people instead of writing messages, but people still write messages to each other if they can't talk. (What did the telephone allow people to do that they couldn't do before?) Talk to each other by . . . not like sending messages but by talking to each other.

Second Grade

Mark

10. Maybe like all rusty because they didn't know how. They just tried to do it and it might be like kind of bad. (How do you think the people made those first books—how do you think they made them?) They like had to write about the book and get like a wooden thing and then like make this cover and then they put it on the top and then . . . or maybe they just took paper and put it there, and then they like colored it what it was, and then they like got paper and writed in it, and then at the last part, they just put "the end" and then they put the colored paper on the back. (When you say they wrote it, do you mean they wrote it themselves with a pen or pencil?) Yeah.

11. Probably happy because they didn't have to take that much time. They might have to go the next day and you might be kind of late and you could just go there and then it might be done the next day and you could just like send it to them and give it out. (So printing would make it quicker to make books?) Yeah, because maybe they didn't have time to do stuff, and now they can have time because all they have to do is like print the book, and then when it's done, they can go back and send it out, so they don't have to waste their time so they can't do anything.

12. Pretty happy, because now you don't have to walk or go on a bike. You can just like talk to them.

Emily

10. I don't know. (When the people made those very first books, how did they make them?) By hand. (What did they make them of?) I don't know.

11. I don't know.

12. I don't know that either.

Third Grade

Dale

10. Maybe a rock carved with the letters or words. (But what about when they made the first real book that wasn't a rock? How do you think they made that?) Cut down a tree and get some of the paper out of the tree. (OK, they had to have some paper. Then what?) You'd have to have one of those pens that has a feather at the end.

11. It helped people send messages or write messages. (Are there other things that the invention of printing allowed people to do that they couldn't do before?) I don't know.

12. It helped them so they could talk to different places on there. (What was new about that?) Talk to other people farther away without having to go there.

Chelsea

10. Pale colors, old, dusty, really old from being written back then. (When the people made those first books, how did they make them?) Probably they took the paper,.and they used it for making a book. You know that. They probably used a cover—maybe out of the same thing that they wrote the pages on, but they added something else that's really hard. I don't know what it would be.

11. It would be better because when you don't have to write it, it'd be easier. It would just show up on the paper. You would just type it in and then do it in the size you want it, and when you write it by hand, you can't do all those sizes and cool ways, where if you tried to do Japanese, that'd be hard if you were an American. (Yeah, it changed the nature of the books, but how did it change the world?) Probably cause they added more kinds of stuff to it, like regular paper now and they had harder covers, not just like paper covers but they have cardboard covers. I forgot what I was going to say. (What did printing bring to people that they didn't have before?) Probably they think that's kind of weird because they were only used to drawing and doing motions of what they did or saw. I don't know.

12. You wouldn't have to tell someone to take a message to give it to them, and walk far to give it to them. Now, they've just got to dial in the number that the other person has and it'll send right across the country.

Grade Level Differences

Most of the categories for coding responses to Questions 10-12 showed significant relationships with grade level. Younger students were more likely than older students to be unable to answer each of these questions, as well as to answer Question 12 by saying that the telephone made it possible for us to call or talk to other people but then being unable to explain why this was better than before. The remaining significant relationships with grade level were all positive ones indicating that older students were more likely than younger ones to provide the most sophisticated responses to the questions. Older students were more likely to say that the earliest books had no color and no or few pictures; that people made them using feather pens, ink, or paint; that they used paper; and that they wrote or drew the pictures by hand. They also were more likely to give "other" responses that were mostly sophisticated ones.

Older students also were more likely to say that following the invention of the printing press, printed materials were easier to read; that people making books would not need to write and thus not get their hands as tired; that multiple copies of printed matter could be made with greater speed or ease; that more people would have access to more books; and that books began to appear in typeface instead of cursive writing. Finally, the older students also were more likely to say that after the invention of the telephone, people could converse without having to be face to face and without having to write letters.

Achievement Level and Gender Differences

This set of categories showed only six significant relationships with achievement level and only two with gender. One of the relationships with achievement level was nonlinear: Average achievers were less likely than lower or higher achievers to say that the earliest books were made out of wood, bark, or cardboard. Otherwise, the significant relationships with achievement level fell into the expected pattern. Lower achievers were more likely to be unable to respond to Question 11 and more likely to give a low level response to Question 12 (recognizing that the telephone allowed people to call or talk to other people but being unable to explain how this was better than before), and higher achievers were more likely to say that printed materials would be easier to read and book production would be accomplished more quickly or with less work following the invention of the printing press and that people could communicate across distances without having to write letters following the invention of the telephone.

The gender differences indicated that girls were more likely than boys to say that people used pens, pencils, markers, or crayons to make early books and to say that the telephone made it possible to converse with people across distances without having to write letters. The first of these responses was part of a somewhat more general tendency for the girls to have more to say about the earliest books than the boys did. The second one probably doesn't mean much because although nine more girls said that the telephone allowed people to converse across distances without having to write letters, five more boys said that the telephone allowed people to converse without being face to face. More generally, we are finding as we typically do that few of the response categories show significant gender differences and that the differences that do appear do not fall into broad, easily interpretable patterns.

Relationships Among Response Categories

Students who said that the invention of the printing press made it possible for people to make multiple copies of text with greater speed or ease were more likely than other students to say that after the invention of the printing press, more books could be read by more people. Students who said that the telephone changed the world by enabling people to call or talk to other people but then were unable to explain further were more likely than other students to be unable to respond to many of the other questions on the interview. Otherwise, the only noteworthy intercorrelations for this set of response categories were relationships between some of the more sophisticated responses and the maturity set for the interview as a whole. These sophisticated responses included: People used feather pens, ink, or paint to make the earliest books; after the printing press people could make books without having to write them out and their hands would not get as tired; after the printing press people could make multiple copies of text with greater speed or ease; after the printing press more books could be read by more people; the telephone allowed people to converse without being face to face; and the telephone allowed people to communicate across distances without having to write letters.

Rare and Unique Responses

Question 10

Most students who were able to respond to the question had good ideas about early books, although several misconceptions were expressed. Some students started out talking about carving on rocks but then switched to better responses when asked about the first books that looked more like the books of today. Several students added covering and/or binding the book as a step in the process, although usually without much clarity about how this would be accomplished. A few students clearly were drawing from experiences of making books in class as they answered the question.

Kindergarten: They were just like today's books; books about Indians; they had no pencils so they used "coloring sticks" to make homemade wooden books.

First grade: They had soft covers and were "written by this little machine" [probably thinking of a typewriter]; they drew pictures on pages, then sent the pages out to have a cover put on them; they wrote on stone with "strong sticks;" books about famous people like George Washington or Bush Clash (sic); made out of tree bark; on brownish paper; big books with lots of pages [Bibles?]; soft covers; the pages were bumpier and they wrote with a typewriter.

The following first grader is quoted at length, partly because he was the only student who mentioned block letter printing: "Carvings on rocks and wood. (When people made the first books that weren't just rock or wood but looked something like a book, how do you think they made it?) They made paper out of wood. They'd sort of like chop all the wood into little pieces and then they like put it in a steamer, I think, and then they flattened it out, and it came out as paper, I think. (OK, so then they had paper. Then what did they do?) I got this from a cartoon. They took a piece of paper and folded it, and you know how they have that hot glue machine. (OK, after they had the paper, then what did they do?) They had like these black carvings, like letters carved on them and they like printed it—one big and the rest like little. (OK, so it had a big first letter. I know what you mean. What about on the pages? How do you think they got the stuff on the pages?) Those wood carvings that had letters—they would dip it in ink and then like print it on the page."

Second grade: Described a wooden fastener used to bind the books but couldn't explain clearly; they painted using their fingers because they didn't have pens or brushes; the books looked bold [apparently referring to the big letters being particularly noticeable]; they used berry juice for ink; they had very hard covers, like plastic or something; they were carved into rock; they looked like Bibles; they were made with "leaves and dirt and stuff;" they used animal fur [leather?] for the cover; there were no plastic covers; they used berry juice for ink; they bound the book with string going through holes in the pages; they invented a machine, put wood through it, flattened it out [to make pages], and then made it different colors; the pages were crispy because they didn't have good paper back then; they didn't have big, humungous words like "communication" then, so you wouldn't learn much from reading the books; they stuck the pages together with ooey, gooey muck or something.

Third grade: There were raggedy books with sandy pages and bold words, made using paper, a hard cover, and a bind; they were not big, about five pages, triangular or square, using paste to bind the pages; they looked like our books but had different content; they carved them into rocks at first, then later they cut down a tree to "get some of the paper out of it" and then wrote on the paper; they were very big books; there were not many words or pictures and they had a soft leather cover; they used thin wood shavings as pages; they were made of fur or something [leather?]; the words were in code [lines and dots], and the books were printed using the typewriter that they invented; the pages were gold [referring to the gold letters on the pages, or perhaps the gold on the edges of Bible pages]; they made a cover and somehow bound the book; maybe the just stapled them together or something; they were like scrolls; they were short.

The following third grader appeared to be referring to scrolls in this statement: "They didn't have covers. They were just little sheets of paper with a little bit of writing on them, and they weren't used for just reading—they were used for teaching. (How do you think they were made?) They took a sheet of paper and their ink pen—which was probably a feather—and they put it in ink and wrote. If they messed up, they'd have to start all over again."

Question 11

Most responses to Questions 11 and 12 were well represented by the categories, so there were only a few rare and unique responses.

Kindergarten: None.

First grade: Encyclopedias; they could type letters [student was focused on writing letters rather than books]; they could make bigger books with more pages and have covers on them.

Second grade: Hard covers.

Third grade: They didn't have to kill as many animals to get feathers for pens; if you messed up, you didn't have to write it all over again.

Question 12

Kindergarten: Taking messages.

First grade: By not using tubes to talk with—using telephone lines like today.

Second grade: You can use the phone book to look up people's addresses.

Third grade: You can call to order pizza; some people are rich and call long distance.

Discussion

About three-fourths of the students had ideas about what the first books looked like, and most of these ideas were valid, depicting books written in longhand on primitive forms of paper, perhaps using feather pens or ink made from berry juices. Some thought that the earliest books contained no colors and others thought that they might have been written or illustrated using much more recent inventions (markers, crayons). With the exception of a few students who thought that the typewriter had been invented before the printing press, the students who were able to answer Question 10 understood that until the printing press was invented, making books was a laborious process that required printing or writing the text in longhand (and perhaps illustrating it by hand as well).

Even though only 19 students had been unable to respond to Question 10, 35 were unable to respond to Question 11 and only 16 responded by saying that the invention of the printing press made it possible for people to make multiple copies of text with greater speed or ease and/or for more people to read more books. The responses of the remaining students were accurate but focused on benefits to those who made books (less work required, less tiring on the hands) or improvements in the appearance of the text (easier to read because printed in typeface instead of written in cursive, less likely to get smudged, more likely to have color or illustrations). As has been common with the students' responses to most of the questions in all of our interviews, the responses to Question 11 emphasized a micro-level purview focused on the individuals who might be involved in manufacturing or reading particular books, rather than a macro-level purview that included recognition of the printing press as a fundamental invention that triggered significant changes in the human condition around the world.

Responses to Question 12 were much better. Here, more than two-thirds of the students conveyed understanding of the fact that the invention of the telephone brought fundamental changes in communication options by making it possible for people to converse without being face to face and/or to communicate across distances without having to write letters. This was not surprising because the students generally are better able to answer questions about the recent past than about the more distant past. Apparently, it was much easier for them to envision the nature and implications of communication in a world without the telephone than in a world without the printing press.

Influences on Language Development

The next two questions assessed students' understanding of the ways in which the development of vocabulary is shaped by the people and objects in one's environment.

Question 13. How do babies and young children learn to speak their language? (If the student says something like "from their parents," ask what the parents do) **. . . Sometimes a young child knows what s/he wants to say, but doesn't know the words. What can s/he do? . . . For example, if the child wants to go outside but doesn't know the word "outside," what could s/he do?**

Question 14. Here, we have only a few words that we can use to describe different kinds of snow, like snow, or sleet, or slush. But up in Alaska, the Eskimos' language has a lot of different words that they can use to talk about a lot of different kinds of snow. Why is that? . . . Why do the Eskimos have more words for snow than we do?

All but 12 of the students were able to respond to the first part of Question 13 (Question 13A), which asked about how babies learn to talk. More than three-fourths (65) of these students said that they learned from parents, siblings, or other older people who teach them. In addition or instead, smaller numbers of students said that babies and young children learn a language by listening to it spoken around them (18), that they hear other people talking and copy what they say (13), that speech develops as they get older (12), that they learn it at day care, pre- school, or school (10), that learning to speak is like learning to read and involves learning the alphabet and phonics (9), and that they learn through having conversations with people (7). These were mostly reasonable responses free of misconceptions, although some of the references to speech developing with age seemed to imply that this would occur automatically without input from the environment, and some of the references to learning in school referred to written literacy and described events that occur later than the acquisition of speaking ability (which was what the question asked about).

Except for the 14 students who couldn't respond to Question 13B, the students also showed generally good knowledge about what a young child would probably do if s/he lacked the words to communicate a desire to go outside. More than two-thirds (63) of them said that the child likely would go to the door and use pointing or gesture to try to communicate the idea. In addition or instead, 29 said that s/he would use baby talk or try to say the word, 23 that s/he would cry, whine, or otherwise use sound to draw attention, 12 that s/he would pull or touch the person to try to get their attention, 8 that s/he would wait until she could say the word, and 8 that s/he might use sign language. Again, the vast majority of these responses are accurate and free of misconception, although some of the students who referred to sign language appeared to mean communication through American Sign Language or some equivalent system, not merely pointing or gesturing toward the door.

Question 14 was more difficult for the students. More than a third (34) of them were unable to respond and another 19 produced low-level responses indicating only that Eskimos are different people from us or their language is a different language from ours. However, 48 students said in addition or instead that Eskimos spend more time in snow than we do or live in an environment that contains more snow; 11 said that they know more about snow because of this, and 9 said that they are exposed to more different types of snow. Thus, about half of the students were unable to provide a satisfactory response and the other half were able to communicate at least the general idea that people who live in snowy regions are more likely to have richer snow-related vocabularies than people who live elsewhere. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

13. Their moms teach them. (They teach them how?) When they're hearing when they talk. (Sometimes young children know what they want to say but they don't know how to say it. What can they do then?) Say something different. (What if they wanted to communicate some particular idea and they don't have the words for it? What could they do?) I don't know.

14. I don't know.

Kate

13. Because we teached them to speak our language. (OK, so we teach them. How do we do that?) Every month you say a word and we tell them what name that we call them and tell them what to say. (Sometimes a young child might know what she wants to say but not have the words to say it. What could she do then?) She could ask her parents, and they could tell her what she wants to say when she don't know what to say. (OK, but if she didn't have the words, it would be hard to do that. Like what if she wanted to go outside, but she didn't know the word "outside," what could she do?) She could ask somebody to help her teach it [i.e., teach her the word "outside"].

14. I don't know.

First Grade

Chris

13. I don't know. (Like maybe he wants to go outside but he doesn't know how to say "outside." What could he do?) He could learn to speak and say "outside." (He could do that but that's going to take a long time. Is there anything he could do now before he learns to speak that word?) I don't know.

14. They have lots of snow and they could see lots of different kinds of snow.

Lauren

13. They listen to other people or something, and they learn what words are, like mom, dad, sissy. (What do the people do? Do the children just listen to them or do people actually do something?) They listen to them and doing something. (What?) Like sometimes when my mom's on the phone, my brothers hear my mom talk and she's like acting out something, so they know what she's talking about. (So you're saying they

hear you talk, right?) And they see us act out what it is, but big words they can't do. (Sometimes a young child knows what she wants to say but doesn't know the words. What can she do?) She can listen if there's a word she wants to know and then she'd listen and see if someone was going to say it. (But, for example, if one of your brothers wanted to go outside but didn't know the word "outside," what could he do?) He could say . . . he probably would . . . he might point outside and make a noise.

14. Cause they know more about it because they live real close to it and we have it like once a month or something.

Second Grade

Mark

13. From their mom and dad. (Tell me more about that.) Like when they're a baby, they can say mommy, say daddy, and maybe like when they're one they can finally say it. Cause they learn it from their mom and dad because they keep on copying it and copying it and then when you get it stuck in your head, you just say it. (Sometimes a young child might know what he wants to say but he wouldn't have the words to know how to say it. What could he do?) He could like point to it maybe. (OK. Anything else?) If he could do sign language, and the mom knew or the dad knew, he could just use sign language . . . they could just point to it or something, and if they didn't know and they just like left him alone, he could like just touch it or something like that.

14. Maybe they know the snow more because like mostly every day it snows, and you have to like cover up. (So maybe they know more about snow than we do?) Yeah, because it snows like twice a day or twice a week, and that other one takes like three weeks, so they might know more.

Emily

13. From their mom. (What does their mom do?) Help them—like say words and stuff. (Sometimes a young child knows what she wants to say, but doesn't know the words. For example, if the child wants to go outside but doesn't know the word "outside," what could she do?) I don't know.

14. I don't know.

Third Grade

Dale

13. Their mom or their dad teaches them. (How do they teach them?) I don't know. (Sometimes a young child might know what he wants to say, but he might not have the words to be able to say it. What could he do?) Show someone in sign language or by a picture. (Like what if he wanted to go outside but he didn't know how to say "outside," what could he do?) I don't know.

14. Cause there's more snow up there.

Chelsea

13. Probably after their dad or mom says, like the mom says "mommy" or something or "daddy," or "cat," or "dog." I remember I used to say dog as goggie. (So what did your parents do?) They never really told me what they did, but I imagine that they'd probably tell me what I'm supposed to say and I'd try to say it, and I'd keep on practicing. You've got to learn how to do something really good. (Sometimes a young child knows what she wants to say, but doesn't know the words. What can she do?) Probably she could make motions that she'd probably know how to do, or she could maybe do like . . . I think you can just do motions.

14. Probably because they learned it in a different way, I think from their parents, and their parents probably learned when they were kids if they went to America, but they didn't like it there so they'd go back to Alaska and figure out their own words. (But why would they have so many different kinds of words for snow?) Probably because other people have different imaginations so they probably say they want to have it this way or that way.

Grade Level Differences

Significant linear relationships with grade level appeared for most of the response categories for Questions 13A, 13B, and 14. Younger students were more likely to be unable to respond to these questions, as well as to suggest that speech appears more or less automatically as babies get older (i.e., failing to appreciate the role of input from the environment). Older students were more likely to respond to the questions, and in doing so, to supply more sophisticated responses. In particular, they were more likely to respond to Question 13A by saying that babies learn to talk from being taught by other people; that they hear people talking and copy their speech; that they learn speech at day care, preschool, or school; or that learning to speak is like learning to read or involves the alphabet and phonics. Older students also were more likely to answer Question 13B by suggesting that the young child who wanted to go outside would likely go to the door and point or gesture, pull or touch the adult to try to get attention, or use sign language. These responses to Questions 13A and 13B appeared more responsive to the questions or to answer them more satisfactorily than the alternative responses that did not show significant relationships with grade level. However, we were surprised that the response suggesting that Eskimos know more about snow than we do was not also positively related to grade level. Older students were more likely to answer Question 14 by stating that Eskimos are different people or that their language is different from ours, that they have more snow or spend more time in it, or that they are exposed to more types of snow.

Achievement Level and Gender Differences

These response categories produced four significant relationships with achievement level and six with gender. One of the achievement level relationships was nonlinear: High achievers were least likely but average achievers most likely to suggest that a young child who lacked the words to say that s/he wanted to go outside might try to communicate using sign language. The other significant relationships with achievement level indicated that lower achievers were more likely than other students to suggest that the child might try to communicate using baby talk or trying to say the word, as well as more likely to be unable to answer Question 14. Finally, a positive relationship indicated that the higher achievers were most likely and the lower achievers least likely to suggest that the Eskimo language has more words regarding snow than ours because Eskimos spend more time in snow or have more snow in their environment. Thus, the higher achievers generally responded to these questions more capably than the lower achievers did, but relationships with achievement level were weaker than they are for most other sets of categories.

The six gender differences all involved categories for responding to Question 13. Boys were more likely than girls to be unable to answer Questions 13A and 13B, as well as more likely to answer Question 13B by suggesting that the child would pull or touch the adult to try to get his or her attention (interestingly, a near-significant gender difference on another response category indicated that girls were more likely than boys to talk about the child crying or whining to get attention). Meanwhile, girls were more likely than boys to respond to Question 13A by suggesting that babies learn language from being taught by older people or that they hear people talking and copy their speech, as well as more likely to respond to Question 13B by suggesting that the child would go to the door and point or gesture toward it to indicate a desire to go outside. All six of these gender differences favored the girls, indicating that they knew more than the boys about how language is acquired and how young children try to communicate when they lack needed vocabulary.

Relationships Among Response Categories

The only noteworthy intercorrelations involving this set of categories were relationships between some of the more sophisticated responses and the maturity set of responses to the interview as a whole. Positive correlations with this maturity set were observed for the following response categories: Babies learn to speak from being taught by older people; a child lacking the vocabulary to indicate a desire to go outside would likely go to the door and point or gesture toward it; and Eskimos have more words for snow in their language because they have spent more time in snow or have more snow in their environment.

Rare and Unique Responses

Question 13A

Kindergarten: None.

First grade: They take little books, say the words, and keep on until they get it right; described using letter-sound flashcards at home; people teach babies by telling and using language; babies learn from seeing adults and older siblings act out the meanings, but this doesn't work for big words.

Second grade: They listen, beginning while they are still in the mother's belly where they hear things; parents point to pictures in books and ask "What's this?"

Third grade: They were born with it; it's just like with speaking birds like parrots and parakeets—you say the word over and over until they can repeat it.

Question 13B

There was some resistance to the premise of this question, in that some students kept wanting to say that the child would verbally explain his or her needs to the parent. Some students, for example, depicted the child as using a baby-speech version of the word (in other words, knowing the word but not being able to pronounce it clearly).

Kindergarten: None.

First grade: The child could move his lips and the mother could read them.

Second grade: He could write a note.

Third grade: He could use a picture to show the mother what he wants; he could write it; she could write it; she could point to something that she played with outside and the parents would get used to this as a sign for "outside."

Question 14

The coding categories represented most of the responses well as far as they went, but it should be noted that few of these responses carried the connotations that they might carry from an adult. That is, although many students said that there is much more snow in Alaska than where they lived, very few of them said that this causes the people in Alaska to spend more time thinking about snow or to notice many more different subtypes of snow, and none said anything to the effect that people have to pay close attention to their environment in order to thrive in it. Thus, although many of the older students had the beginnings of this idea, none of them articulated it convincingly.

Kindergarten: None.

First grade: They have more words for snow because they are smarter than us; they invented more words because they couldn't decide on which one to use; they thought of more just by looking at the snow.

Second grade: They know more words for snow because they live by snow, but they don't know more words for cats because they don't live by cats; they live in snow all year, so they take time to think about it and we don't ; they don't have to talk about warm things, so they spend more time talking about cold things.

Third grade: It's because they get so much snow at one time; they want to be unique; scientists up there study different kinds of snow and name them; they use "snow" words more often than we do; they think about snow more than we do because they have it all around them and it's always been there.

Discussion

The students' ideas about how babies learn to talk and how they communicate their desires when they lack specific vocabulary were generally accurate as far as they went and free of misconceptions. The students generally understood that language is acquired both through specific instruction and through general exposure to communication from and among family members and significant others in one's environment, as well as that a young child who lacked the needed vocabulary would probably try to communicate needs by getting adult attention and pointing, gesturing, or attempting to say the word. Girls' responses to this question were generally more satisfactory than boys' responses, possibly because girls typically spend more time playing with dolls and caring for younger siblings.

About half of the students were unable to give a satisfactory response to the question about why the Eskimos' language has more words for snow than ours does, but the other half were able to say that this was because the Eskimos live in a snowy environment. For many of the latter students, however, this was more a guess than a confident response, and usually not one that was elaborated. Few students noted that Eskimos needed to pay careful attention to snow and perhaps differentiate various subtypes for survival reasons, and no student made a general statement to the effect that people need to pay close attention to their environment in order to thrive in it.

Few misconceptions were communicated in responses to these questions, although some students thought that language appears automatically without input from the environment; one thought that a mother could read the lips of her young child in order to ascertain her message; several thought that infants could write or draw to communicate messages that they could not communicate orally; one thought that Eskimos have multiple words for snow because they wanted to be unique and another thought that this was because they couldn't agree on just one word to use; and although one thought that Eskimos had more words for snow because they are smarter than us, several felt the need to indicate that although they may have more words for snow, we have more words for other things.

Overcoming Barriers to Communication

The next set of questions assessed students' understandings about ways in which people can or cannot communicate when they lack a common language, when one of them is deaf, or when one of them is blind.

Question 15. Can people communicate with each other if they don't speak the same language? . . . How? (If student says no or cannot explain, ask: **When Columbus and the Indians first met, were they able to communicate somehow? . . . How?)**

Question 16. Some people are deaf—they can't hear. Can deaf people communicate? . . . How? (If student only mentions sign language or other nonverbal means, ask: **Can deaf people talk?)** (Also, if the student fails to mention lip reading, ask: **"If a deaf person was sitting here watching you talk, could they understand what you were saying?)**

Question 17. Some people are blind—they can't see. Can blind people communicate? . . . How? (If necessary: **Can blind people read? . . . How?)**

Responses to Question 15 indicated that 41 students believed that people cannot communicate if they do not speak a common language, and 11 others said that they didn't know. The remaining 44 students said that communication was possible under these circumstances, and most elaborated by indicating that the people could use gesture or sign language (37), teach each other their languages (20), write down what they wanted to say (14), or use an interpreter that spoke both languages (10). Note that the latter response attempted to deny the premise of the question. Also, the idea that the message could be explained in writing shows lack of awareness that if the other person could not speak the language, they probably couldn't read it either.

About a fourth (25) of the students either did not know whether deaf people can communicate or said that they cannot. Of the remaining students, 57 said that they can use sign language, 17 said that they can talk (spontaneously, before being asked this directly in a follow-up probe), 11 said that they can write, and 6 said that they can read lips.

When probed concerning whether deaf people can understand what we say, and if so how, 65 students said no, 22 said that they can read lips, and 9 didn't know or said yes but could not explain.

When further probed concerning whether deaf people can talk, 31 said no, 8 were unsure and 10 said that some can talk but some cannot. The remaining 47 students said that deaf people can talk, although 10 of them qualified this response by saying that their speech sounds different from other people's or is difficult to understand because it is not clearly enunciated. In summary, a majority of the students understood that deaf people can communicate using speech or sign language, but only a minority understood that they can read lips or communicate through writing.

Responses to Question 17 indicated that more than three-fourths (76) of the students understood that blind people can communicate through speech but only 16 understood that they can read using the Braille system. Almost half (44) thought that blind people cannot read and 7 thought either that blind people can hear but not talk or that blind people can talk but not hear. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

15. Yeah. (How can they do that?) I don't know. (When Columbus and the Indians first met, did they communicate?) No. (So what did they do? Did they just stand there and look at each other?) I don't know.

16. No, cause they can't hear. (Could deaf people understand what you were saying by watching you talk?) No.

17. Not if they don't know who they're talking to. (But if they did . . . if a blind person was sitting right here with us, could they communicate with us?) Yeah, if they told us. (Could they hear us too?) Yes. (Can blind people read?) No.

Kate

15. No. (What do you think happened when Columbus met the Indians for the first time? Did they communicate?) Yeah. (So what did they do?) They said that they didn't have a language but they knew what they said. (How did they know if they didn't speak the same language)? I don't know.

16. No. (Not at all? If a deaf person was here and watching you speak, could they understand what you were saying?) No. (Could they talk to you?) Yeah. (So they could talk, but they couldn't what?) Hear.

17. No, cause they can't see the person that they're talking to. (OK, but if a blind person was right here, right with us, could they communicate with us?) Yeah. (Even though they couldn't see us, they could what?) Still talk to us. (Can a blind person read?) No.

First Grade

Chris

15. No, but they could look in a book. (If there were books around I guess they could. Back when Columbus first met the Indians, what do you think happened? Were they able to communicate at all?) No.

16. They could talk. (That's right—they can talk. Are there any other ways they can communicate?) If they couldn't talk, they could do hand language. (If a deaf person was sitting here watching you talk, could they understand what you were saying?) No.

17. They could talk to us. (That's right—they could talk. Could they hear us?) Yeah. (Can blind people read?) No.

Lauren

15. I think they can. (How do they do that?) By sending messages or something like that. (But wouldn't the messages be in different languages?) Yeah, and the other person might understand what they're saying. (But what if they don't understand? Can they still communicate? . . . When Columbus and the Indians first met, were they able to communicate somehow?) Yeah. (How?) By acting out something.

16. They do it like with sign language. (Can deaf people talk?) No, I don't think so. (Why not?) Cause they couldn't hear.

17. I know that they can communicate, but I don't know how. (Can blind people read?) No. (Why not?) Because they can't see that good. (Can they talk?) Yes.

Second Grade

Mark

15. Yes. (How?) Cause maybe like the first one would say, "You talk English and they talk Chinese," and you might know Chinese and they tell you something, and then you talk Chinese back. (OK, but that's if you knew their language. What if they didn't? What if you only knew English and they only knew Chinese? They just don't communicate?) I don't know. (Let's say you went to China on vacation. Do you think you would be able to communicate with the Chinese people?) Yes, I guess. Because they would say something and you could like sound it out, or maybe they'd say something and maybe part of the word you could find out. (So you think you might be able to learn some of their language?) Yeah. (Do you think you might be able to communicate something like "Where is a McDonald's?") Yeah. (How could you do that?) You might have like a McDonald's figure and then you'd try to teach them how to say stuff, and then you say "McDonald's" and then they try to say it and then you like . . . and then you show them. (OK, so you might be teaching them your language too. How do you think Columbus and the Indians communicated when they first met?) I think Columbus like teached them how to say Michigan language and then they started saying stuff.

16. Sign language. (OK, they can use sign language. Any other way?) No. (Can they talk?) Yeah, but when you talk back, they won't know what you said. (So they can talk to you but they can't hear you?) Yeah. (If they were sitting here watching you talk to them, would they be able to understand you?) No.

17. You don't really need your eyes to communicate. You can just talk and they can hear, but then you could communicate because you talk. (OK, that's right. Can blind people read?) Yes. (How?) Well, on TV, there's like this kid and he teaches them how to read books, and he teaches them how and then they read books. (How do they read books?) They might just . . . maybe he keeps on reading the book over and over and over and over with like a whole bunch of books and then he keeps on doing it over, and then you've finally got it in your brain, and then when you read it, you know what it is. (Are you talking about reading books to the blind people?) And then they get it stuck in their

head and they know what it is. (So they might be able to memorize the books. Is there a way they could read books by themselves?) Well, maybe they put something in their eyes and then they can a little bit see the word, and then they can read it.

Emily

15. Yeah. (How?) Like one person can talk like this and one can use sign language.

16. Um . . . I don't know. (Can deaf people talk?) I think so. (How do deaf people communicate?) Sign language, like they can use their hands in sign language. (If a deaf person was sitting here watching you talk, could they understand what you were saying?) No.

17. Yeah. (How do they communicate?) I think they use sign language too. (Can blind people read?) No.

Third Grade

Dale

15. By using sign language.

16. By talking. (OK, they can speak. What else could they do?) I don't know. (If a deaf person was sitting here watching you speak, could they understand what you were saying?) No.

17. By talking and listening to other people. (Can blind people read?) Yeah. (How?) By those little dots that they put their fingers on.

Chelsea

15. No, not that well, unless you know the language that they are saying. (Well, when Columbus and the Indians first met, were they able to communicate somehow?) I don't think so.

16. Yeah, but using your hands, like doing letters and spelling something. (Can deaf people talk?) No—well, they talk kind of funny like they've got something caught in their throat and it's like covering half of their throat or their voice box, like covering it or something, so they talk really weird. It's hard to understand them. (Now, if a deaf person was sitting here watching you talk, could they understand what you were saying?) Yeah, probably if they knew how to lip read. I think they'd just know how to lip read and stuff.

17. Yeah, probably with dogs, and the dog would like bark at the other dog, and the dog would probably try to tell the master if the master could understand the dog. That's how they probably send messages to each other. (Who could talk?) The people that are blind.

> But sometimes people might have a sore throat and then they can't talk because they wanted their throat to rest or something like that. (Why can they talk?) It's probably just happening with their eyes—they lost their eye power—not their voice power. (Can blind people read?) Yeah, with Braille reading in books that we have and the girls' bathroom sign. [i.e., the school has Braille signs outside the lavatories to indicate whether they are for boys or girls]

Grade Level Differences

Most of the categories for responses to Questions 15-17 showed significant relationships with grade level. Younger students were more likely to be unable to answer Question 15, whereas older students were more likely to say that people can communicate with each other even if they do not speak a common language, to suggest that they could use gesture or sign language, to raise the possibility of using an interpreter that speaks both languages, or to suggest (unrealistically) that they could write down their messages.

Responses concerning communication with deaf people were especially strongly associated with grade level. Most of the kindergarteners did not know whether deaf people can communicate or thought that they could not, whereas either most or all of the students in the other grade groups understood that deaf people can communicate. In addition, older students were more likely to say that deaf people can use sign language, can read lips, can write, and can talk. When probed about whether deaf people can understand what other people say, younger students were more likely to say no and older students more likely to say yes—through reading lips. When probed about whether deaf people can talk, younger students were more likely to be unable to respond. There were no significant relationships to grade level for answering either yes or no to this question. However, older students were more likely to provide qualified responses (deaf people can talk but their speech sounds different from other people's speech; some deaf people can talk and some cannot).

Question 17 asked about communication with blind people. Here, younger students were more likely to say that blind people cannot communicate, to think that they cannot read, or to think that in addition to being blind they cannot hear or cannot talk. Older students were more likely to say that blind people can communicate and to state that they can read Braille. No kindergartener or first grader mentioned reading Braille, but this possibility was noted by four second graders and 12 third graders (usually by talking about blind people reading by running their fingers across dots, without mentioning the term "Braille"). In general, younger students tended to exaggerate the scope of these handicaps, where as older students were more aware of ways that deaf and blind people can compensate for their handicaps and still communicate with other people.

Achievement Level and Gender Differences

This set of categories yielded five significant relationships with achievement level and six with gender. Two of the relationships with achievement level were nonlinear: average achievers were more likely than other students to say that people who lacked a common language could learn to communicate by learning the other people's language, but less likely than other students to think that blind people also are unable to hear or to speak. The remaining relationships with achievement level were linear, indicating that the lower achievers were more likely to be unable to explain how deaf people can understand what other people say and more likely to say that they can talk but their speech sounds different from other people's speech, whereas high achievers were more likely to say that some deaf people can speak but some cannot. In general, significant relationships with achievement level for this set of categories were few in number and mixed in direction, indicating that what the children knew about the communication competencies of deaf and blind people appeared to have been learned mostly through contact with deaf or blind people or other out-of-school experiences, except perhaps for knowing that blind people can read text rendered in Braille.

The gender differences once again favored the girls. Girls were more likely than boys to say that deaf people can read lips (in responding to both Questions 16A and 16B). Boys were more likely than girls to spontaneously say that deaf people can talk before being asked about this directly, to say that deaf people cannot understand what other people say, to be unable to respond to Question 16C when asked directly if deaf people can talk, and to say that blind people cannot read. The seeming contradiction on the issue of whether deaf people can talk occurred because different subgroups of boys made contrasting responses to Questions 16A and 16C. In responding to Question 16A, a subgroup of 13 boys (but only 4 girls) spontaneously said that deaf people can talk. Later, when asked about this directly in Question 16C, a different subgroup of 7 boys (but only 1 girl) were unable to respond. There was no clear gender difference on this issue (when asked directly if deaf people can talk, 23 boys and 24 girls said yes).

In general, the gender differences favored the girls because the boys tended to exaggerate the scope of handicaps: They were more likely to think that deaf people cannot understand what we say and that blind people cannot read, whereas the girls were more likely to realize that deaf people may be able to understand what others say by reading their lips. There also were nonsignificant trends favoring girls for understanding that deaf people can communicate using sign language or writing and that blind people can read Braille.

Relationships Among Response Categories

Students who answered Question 16A by saying that deaf people can communicate were more likely than other students to answer Question 17 by also saying that blind people can communicate. These students also were more likely than other students to say that deaf people can read lips and that blind people can read Braille. Students who said that deaf people can communicate using sign language were more likely than other students to have said that cave people communicated using sign language, that Indians could use sign language to pass on what they had learned, that a young child who did not know the word "outside" could communicate a desire to go outside by going to the door and pointing or gesturing, and that people who lack a common language could communicate through sign language or gesture. Thus, these students showed a tendency to bring up sign language whenever it might have been relevant (however, the correlation with the response indicating that Columbus and the Indians might have communicated through sign language, although positive, was not statistically significant).

Students who mentioned lip reading in responding to Question 16A were more likely than other students to mention it as well in responding to Question 16B. In addition, there was a strong correlation between responding to Question 16B by saying that deaf people can understand what other people say by reading their lips and responding to Question 17 by saying that blind people can read using Braille. Thus, a subset of students was particularly knowledgeable about the major ways in which deaf and blind people overcome the primary sensory deficits imposed by their handicaps.

Students who thought that blind people cannot read and students who thought that blind people also cannot hear or cannot talk were more likely than other students to be unable to respond to many other questions on the interview. At the other extreme, several responses in this set were part of the maturity set of responses to the interview as a whole: saying that deaf people can communicate, that they can read lips, and that they can write; noting that the speech of deaf people may sound different from other people's speech; and saying that blind people can communicate and that they can read Braille.

Rare and Unique Responses

Question 15

This question about whether people can communicate if they lack a common language produced some resistance to the premise. Many students said, for example, that the people could communicate if they spoke the same language, that they could talk using the words that they both knew, or they "could tell the other people ______." Also, many students initially said that people could not communicate under these circumstances, but then were able to identify one or more ways to communicate when asked about Columbus meeting the Indians or themselves on vacation in France or China.

Kindergarten: The Indians told Columbus that they didn't have a language but they understood what one another said [i.e., they could interpret other Indians' grunts, groans, whoops, hollers, etc.].

First grade: They didn't have actual words like "snow," so they had to use all kinds of words for snow; they could look in a book; they could use smoke signals.

Second grade: They could use art; they could speak slowly.

Third grade: Both Columbus and the Indians spoke English, although the Indians spoke a rougher version; the Indians invented sign language; they could communicate using symbols [presumably written on the ground]; they could draw.

The following third grader is quoted for one of the better responses: "They could use sign language or something like that. They couldn't write to each other because someone would write in a different language than the other person . . . maybe they could act it out or draw a picture of it or something."

Question 16

Kindergarten: Deaf people can use special headphones so that "their hearing problem comes out" [i.e., they can hear through the phones].

First grade: They can talk, but they can't hear themselves, but we can hear them; they can talk, but it's hard for them to learn.

Second grade: They look at other people's mouths and they try to say the words, like "ball," and it comes out just very long, like "baalll;" if they were born like that, they can't speak because they've never heard anything, but if it happened like when they were old, they can speak because they knew those words in their head for a long time; they could watch other people talk and see how they move their jaw, then try to move their jaw like that; some of them can talk when they look to see how other people say words—they can try out the words too and see if they can say it; they can talk, but it's hard for them because they can't hear what they're saying; they can say words, but it would be really hard to understand.

Third grade: They can talk, but not very well; explains that deaf people have the physical equipment needed to speak but do not talk because they cannot hear and thus never learn spoken language; deaf people talk inside their minds, but not really—it's hard to teach them, but if they could hear words using hearing aids, then they could learn them; yes, but they wouldn't know what they are saying—probably they could think it in their mind and then say it, and the other person would then repeat it and see if they got it right; they talk kind of funny, like they have something caught in their throat and it's covering half of their voice box or something, so they talk really weird and it's hard to understand them; they can talk "if they got deaf when they already knew some words, but not if they were born deaf."

"Some of them can talk and some can't—some were born deaf and some already knew how to talk and they could do it. (So the ones who were born deaf—can they not learn how to talk?) Not really, because they couldn't hear the person or something."

"They sometimes can talk with their lips, but they don't say anything, so you have to read their lips. (You mean they move their lips but they don't speak?) Yes. (Could they speak if they wanted to?) No."

"Yes, they can communicate because my friend's grandparents are deaf. She can communicate with them, not with sign language, but with this special phone that you use to type with and then that person could read it and type out an answer. (Are there other ways that deaf people can communicate?) Sign language. (OK, any others?) Not that I know of. (Can they talk?) They make like these weird noises but they can't talk."

"Sometimes they know the words that you're moving your lips to and sometimes they'll learn to mimic with their lips, and then they just move their lips. I know a person who did that. (So they can read your lips and then they can talk too?) They just move their lips in words and other people have to try to get the words right. (Can they talk?) Actually, no. Sometimes they can if they're old enough and they were like 10 years old, they would be able to talk if they just went deaf, but if they were born deaf, they couldn't because they can't hear the words."

Question 17

Some students began their answer to this question by talking about blind people feeling their way, using a cane or dog to get around, or other issues focused on transportation rather than communication. However, they all switched appropriately when probed.

Kindergarten: Blind people cannot communicate because they cannot see your face or know what you are saying [typical response of students who thought of blind people as also being deaf]; no, because they can't see the person they're talking to [this and several other responses seemed to imply a belief that communication involves conversation between people who know each other and can see as well as hear each other as they talk, or at least that it wouldn't be communication if a blind person spoke to somebody that he or she could not see].

First grade: They can talk on the phone; they can read certain books [not explained further]; they have "a special way to see" [unexplained further].

Second grade: They communicate using sign language; they would communicate better if they would take their glasses off because the eyes express feelings; they can read special books that are really big and you can get a magnifying glass and hold the book really close and then you can picture out the words.

"On TV there's this kid who teaches them how to read books. He keeps on reading the books over and over and over and over with like a whole bunch of books and he keeps on doing it over, and then you finally get it in your brain and then when you read it you know what it is. (Are you talking about reading books to blind people?) And then they get it stuck in their head and they know what it is. (So they might be able to memorize the books. Is there a way that they could read the books by themselves?) They can, but I don't know how. Maybe they put something in their eyes and then they can see the word a little bit and read it." [Magical explanation]

Third grade: They use sign language.

Discussion

The students found it difficult to visualize and talk about communication among people who do not share a common language, although it became easier for them to respond if they were asked about Columbus communicating with the Indians or themselves communicating with French or Chinese people encountered on vacations to France or China. Still, some students had difficulty imagining what it would be like to confront other human beings without any shared language, and as a result, they resisted the premise of the question by suggesting that they might have some words in common, that they could write messages that the other people would be able to read, that they would explain to the other people that they did not understand their language, etc. Only one student suggested that they might speak more slowly, which is a common response of people trying to communicate with others who do not understand their language.

In general, although almost half of the students said that people who do not share a common language could communicate, only 37 understood that this communication would have to depend primarily if not solely on gesture or sign language. Alternative responses involved attempts to undermine the premise of the question (they could use an interpreter), unrealistic suggestions (they could exchange written messages), or solutions that were more realistic but would take a great deal of time and thus not accomplish immediate communication goals (teach each other their languages).

Rephrasing the question to focus on examples (Columbus and the Indians or the student on vacation in France or China) made it easier for the students to respond, but still left most of them baffled as to how communication might take place. This was not surprising, because studies involving interviewing children often find that they have difficulty with questions that require them to imagine situations that are hypothetical or outside of their experience, especially situations that contrast with reality as they know it. None of these students reported any personal experiences with attempts to communicate with people who did not know any English.

The students varied considerably in their knowledge about the communication abilities of deaf and blind people, partly because some were able to draw upon personal experiences that occurred primarily outside of school (although the sophistication of responses to these questions was closely associated with grade level). Some students (especially younger ones) tended to exaggerate the scope of the deficits imposed by these handicaps, such as by thinking that deaf or blind people cannot communicate at all or that blind people also are unable to speak or to hear. Oddly, the latter students always said either that blind people can hear but cannot talk or that they can talk but cannot hear (but never both).

Other students (primarily older ones) usually understood that deaf people may be able to read lips to understand what other people are saying and can express themselves through speech, sign language, or writing. They also understood that blind people can carry on conversations and can read Braille materials. A few students displayed somewhat detailed knowledge of deaf or blind people, usually based on personal experiences with them. Ten students understood, for example, that although deaf people can talk, their speech is usually not as clearly articulated as other people's speech, and another 10 understood that people who became deaf after childhood are more likely to be able to speak well than people born deaf. In addition, smaller numbers of students understood that there are degrees of deafness and blindness, and that people who are not totally deaf or blind can be helped through compensatory technologies.

At least for students who understood that deaf and blind people can communicate, the responses tended to be accurate as far as they went and free of misconceptions. Also, it is noteworthy that responses concerning deaf and blind people often were accompanied by expressions of empathy and recognition that these are otherwise normal people who have sensory deficits. There was no disparagement of deaf or blind people and no suggestion that they are generally mentally defective, weird, scary, etc. Perhaps this is a reflection of movements in recent years toward inclusion of handicapped students in regular classrooms and education of students about the nature of handicaps and how to interact with handicapped people.

Addition of New Words to Languages

The next question was included to see if students understood that inventions and knowledge expansion lead to the coining of new words, and if so, to see if they could provide some examples of words introduced relatively recently.

Question 18. Are there some words that we use today that didn't exist 50 years ago? . . . What are some examples? (If student says no, probe by asking: **Does anyone ever invent new words? . . . What are some words that might be pretty new?)**

All but 10 of the students understood that there are some words we use today that didn't exist 50 years ago, although 32 of these were unable to suggest any examples. In addition, 25 students cited poor examples—words that have been in existence for much longer than 50 years. In addition or instead, these students also cited valid examples, typically either words associated with technological inventions (computer, television, etc.) or words reflecting advances in popular culture (slang terms such as "cool" or "duh," as well as words that describe artifacts or new practices such as "compost pile"). Applying liberal acceptance criteria (i.e., taking as valid any term that was introduced within the last century, not just the last 50 years), we determined that 16 students cited only poor examples, 9 cited both poor and good examples, and 18 cited good examples only. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

18. No.

Kate

18. No. (Do you think anyone ever invents new words?) Yeah. (So can you think of any words that are probably new that were invented not long ago?) No.

First Grade

Chris

18. I don't know.

Lauren

18. I do not know. (Does anyone ever invent new words?) I don't think so.

Second Grade

Mark

18. Lugnuts. (You mean like the Lansing Lugnuts?) Yes. (Why did you say that?) Because they didn't know how to say it. (Can you think of any other words that might be pretty new words that didn't used to be around?) Like March, April, May, June, July. (Calendar words? You think they're pretty new?) You mean like before Columbus was there or after? (Columbus was a long time ago, but do you think there's any words that we know today that weren't around when your grandfather was a boy?) Maybe not. Bookmark. (

Emily

18. Yes. (What are some examples?) Um . . . I don't know.

Third Grade

Dale

18. Recess, grocery store, restaurant, bank. (Why are those new words?) Cause they didn't have money back then. (Do you think there are any words that are brand new, like around for just the last five or ten years?) No.

Chelsea

18. Probably laser or strobe light or like surf board or something like that, or like purse or bag, or a tote which would be a bag. (Does anyone ever invent new words?) Yeah, some people if they find them out and make them up and say, "Well, this means this and that means that." If they become a teacher, they can tell the kids that this means that and that means this.

Grade Level Differences

Younger students were more likely to be unable to answer this question, and there was a nonlinear relationship for answering the question in the affirmative but then being unable to give examples. Otherwise, older students were more able to supply valid examples (both technological examples and popular culture examples), and in particular, more likely to supply good examples only.

Achievement Level and Gender Differences

There were two significant relationships with achievement level and one with gender. Higher achieving students were more likely than lower achieving students to mention technical examples, as well as more likely to supply good examples only. Boys were more likely than girls to cite both poor and good examples. Although it was the only gender difference to reach significance, the latter difference was part of a larger pattern indicating a tendency for boys to provide more of all kinds of examples in responding to Question 18.

Relationships Among Response Categories

Mention of technical examples and citing good examples only were correlated with the maturity set of responses to the interview as a whole.

Rare and Unique Responses

Four students, in addition to or instead of naming specific words, said that new words are coined when new inventions appear. Another four students mentioned "Supercalifragilisticexpialadosius," reasoning that this must be a new word because it was introduced in a movie.

Kindergarten: People; YMCA [apparently because the student had been to a newly-built YMCA]; blue.

First grade: Bike, roller coaster, videotape, microphone, computer [this was one of several students who looked around the room to get ideas for responding to this question and noted various technological equipment, including equipment used in the interview]; clock, duh [as used in current slang]; hello; Power Rangers in Space [title of a new television show]; seahorse; yes, no, cool songs like Hansen; music; telephone, compost pile; everyone [because it is a long word]; marsupials; microwave.

Second grade: Science, tape recorder, microphone, mouse pad; door; Lugnuts [as in the Lansing Lugnuts baseball team]; March, April, May, June; bookmark; Michigan, Mexico; telephone; the names of the months, the names of the colors, pencil, crayon, marker; phone, numbers, triangles; "in the past they used 'ent' words like didn't and haven't, but we don't use them anymore."

Third grade: Wanna, gonna [slang]; snow; recess, grocery store, restaurant, bank [the latter on the grounds that they didn't have money in the old days]; turtle, tortoise; TV, computer; car; video, Nintendo, color camcorder; computer, car, robe [because you put one on when you come out of a shower, and they didn't used to have showers]; scientific things like computers; Chippewa and other tribal names [in the past they just referred to "these Native Americans"]; please, thank you, story; X-ray fish; firewood; laser, strobe light, surf board, purse, tote bag; videotape; computer; television; days of the week names and some animals; store names and video games; words that kids use today like "cool."

Discussion

Most of the students understood that new words enter the language continually, although fewer than half could suggest examples and just 18 cited only good examples. A few students unaccountably suggested examples such as "people," "door," or the words for the days of the week, the months of the year, or the colors, but most of the students who were able to suggest examples either came up with terms that were in fact introduced relatively recently or at least displayed good reasoning even if their suggestions were incorrect. For example, some students mentioned terms that they associated with science (marsupials, tortoise, X-ray fish) on the grounds that most things scientific were discovered relatively recently. Others reasoned sensibly but from premises that happened to be incorrect ("bank" is a new word because money is relatively recent, "robe" is a new word because we use it when we complete a shower and

BEST COPY AVAILABLE

showers are relatively recent, and the names for Native American tribes are new words because in the past they just referred to Native Americans collectively as "Native Americans").

The latter response is noteworthy not only as an example of good reasoning from false premises but also as an example of one of several confusions we have seen connected with the term "Native Americans:" Some students wonder why Native Americans are called Native Americans if they came here from Asia, others think that the Native Americans were the early colonists (called such to distinguish them both from Indians and from the British), and one of the third graders interviewed for this study thought that "Native Americans" (not "Indians") was a generic name that Europeans use to refer to American Indians collectively because they didn't know or care enough to differentiate among them and use their more specific tribal names. We have found that many primary-grade students are confused about the meaning of this term, which is why we used the term "Indians" in our interviews.

Communication With Symbols

The next question assessed students' understanding of the fact that sometimes it is more efficient to communicate using symbols rather than words.

Question 19. (Show student the illustrations of commonly seen signs that use symbols but not words to communicate "railroad crossing ahead" and "no bicycling"): **Sometimes communication is done with symbols instead of words. Why are these symbols used instead of words?** (If student only explains why the sign is there but doesn't explain why the sign uses symbols instead of words, probe for the latter explanation.)

More than a third (36) of the students were unable to respond to this question, even though almost all of them knew the meaning of the signs. Among those who did respond, some focused on issues involved in creating the signs: The sign maker didn't want to take time to write out the words (14) or had to use symbols because the words wouldn't fit on the sign or they would have to be written so small that they would be difficult to read (22). Other students focused on the effectiveness of the sign as a device for communicating with people who might approach it on the street: Symbols allow the sign to be understood by people who cannot read or who do not know English (16), symbols are easier to see or the words are harder to read than the symbols (15), or written signs take longer to read than the symbolic versions do (15). Of the 60 students who were able to respond to Question 19, 35 included the key idea that the symbolic signs are quicker or easier to read than the equivalent verbal message would be. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

19. Cause they need to know that thing. (Why would they put up a sign like that instead of just a sign that said "No Bikes.") I don't know.

Kate

19. I don't know.

First Grade

Chris

19. Cause there's no one out there that is fast enough to tell them if they were walking to go. (If there was somebody to talk to them, yeah, you're right, but they can put up signs. They could put up a sign that says "railroad crossing ahead," but instead they put that. Why do you think they put that?) Because they go too fast to read it.

Lauren

19. They're used because they don't take up that much room to write it or something. (But if you write "no bikes," that wouldn't take that much space. So why do you think they use symbols?) I don't know.

Second Grade

Mark

19. It would be easier because maybe they can't read, but they can just figure and use a symbol if you can't. (Any other reason why they might use symbols?) So maybe a kid rides his bike and he went right past it and he doesn't know what it's saying because he went so fast he couldn't read it, and if it's just like that and he goes super fast, he could know because it just has a bike and a line. (So you'd be less likely to miss it then, cause it's quicker and easier to understand?) Yeah.

Emily

19. Cause it's easier to do that instead of write. (Is there any other reason why they might decide to use symbols?) No.

Third Grade

Dale

19. Cause they're not there to tell people [i.e., to tell them personally]. (Well, instead of putting this sign up here, they could have put up a sign that said "railroad crossing ahead." So how come they put up this instead of a sign with words?) I don't know.

Chelsea

19. Cause some people might be deaf and they can't hear but they can still see things, or if they're blind and they can't see, they could probably listen, and they could make up a machine that said no more bikes or railroad crossing. That'd be cool. (But why would they put these on the side of the road?) So they'd know it was a railroad crossing sign and they'd know a train would be coming across sometimes. (But why don't they use words?) Probably because the sign's too small or that's just how they made it.

Grade Level Differences

Younger students were more likely to be unable to respond to the question, whereas older students were more likely to say that the words would not fit on the sign or writing them out would make them too small, that symbols are easier to see or words are harder to read, and in general, to include the idea that symbolic signs are quicker or easier to read than the equivalent verbal message would be.

Achievement Level and Gender Differences

This set of categories yielded only one significant relationship with achievement level and one with gender. Higher achievers were more likely than lower achievers to say that symbols are used on these signs because the equivalent message written out in words would take longer to read. Boys were more likely than girls to say that symbols are used because they are easier to see or the words would be harder to read. In general, the boys responded slightly more effectively to this question than the girls did.

Relationships Among Response Categories

None of these categories showed partly noteworthy relationships with other categories.

Rare and Unique Responses

Many students began to answer the question by saying that the sign is needed because the city cannot always have a person standing out there to warn people. However, clarification and probing led most of these students to shift to the issue of words vs. symbols on the sign. Most of these responses were well captured by the coding categories, so there are few rare and unique responses to list.

Kindergarten: None.

First grade: The sign would get too big and heavy and fall over if you used a lot of words.

Second grade: The presidents might like it better [i.e., using symbols].

Third grade: Symbols look better; symbols are shorter [unexplained further].

Discussion

Responses to Question 19 were generally accurate as far as they went and free of misconceptions. However, 36 students were unable to suggest a reason why symbols are used instead of words on such signs, and another 25 gave responses that focused on the whims of the sign maker or in some other way failed to communicate appreciation of the fact that symbols are quicker and easier to read (and universally interpretable regardless of the person's literacy level or native language). Thus, only a little more than a third (35) of the students clearly understood the reasons for using symbols on these signs.

The Workings of the Postal Service

The next question was asked to assess the students' knowledge about the different personnel employed by the U.S. postal system and the functions they carry out in the process of picking up and delivering a birthday card.

Question 20. My brother lives in Chicago and I want to send him a birthday card. What do I have to do to send him the card? . . . OK, I put the card in the mail box. Then what happens to it? . . . Then what? . . . Etc. (Probe to see if the student understands the following steps: I put the card in my mail box; the card is taken to my local post office; it is sorted and grouped with other mail headed for Chicago; this mail is trucked to the airport and put on a flight to Chicago; from the Chicago airport it is trucked to my brother's post office; there it is sorted by mail routes; then the mail carrier assigned to my brother's route delivers the card to his home.)

All but 10 of the students were able to respond to this question. The most popular steps included were that you or your mail carrier would take the letter to your local post office (67), the card would be transported to Chicago by truck, plane, or boat (58), and the card would be taken to the Chicago post office and processed there before being delivered to your brother (46). Other commonly occurring response elements included talking about stamps, either in terms of attaching a stamp to the envelope before mailing the card or about how the stamp would be cancelled later at the post office (27), saying that the same mail carrier who picked up the birthday card at your house would deliver it personally to your brother in Chicago (19), talking about how mail is sorted at your local post office by destination, so that the birthday card would be included with mail headed for Chicago (15), and stating that once the card reaches Chicago, it would be taken directly to your brother's house (17).

These responses included both valid and invalid elements (the latter including the idea that the same mail carrier who picks up the birthday card at your house would take it to Chicago and deliver it to your brother personally, as well as the idea that as soon as the card reaches Chicago it would be taken directly to your brother's house rather than first going to the central post office for sorting and assignment to routes). Of the 86 students who were able to respond to this question by indicating one or more steps involved in sending a birthday card to Chicago, only 38 gave reasonably complete and accurate responses. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

20. Put it in the mail box and the mail man will get it. (Then what happens to it?) He takes it there. (To Chicago where my brother is?) Yeah. (My own mail man takes it to Chicago, or does somebody else?) He drives there.

Kate

20 You have to write it and then mail it to Chicago. (How do I mail it?) You put it in your mail box. (Then what happens to it?) The mail person takes it and takes it to the place. (Do you mean where my brother lives in Chicago?) Yeah. (Do you think my mail man takes it all the way to Chicago?) Maybe they stop by the mail place and they could give it to people and then they could drive . . . a mail person could drive it to Chicago, they could drive there and take it. (OK, so you think my mail man takes it to the post office and then somebody else drives it to Chicago?) Yeah. (OK. What does that person do when he gets it to Chicago?) He goes and finds the right person and then they give it to him. (So it goes right to my brother—not to somewhere else first?) Right.

First Grade

Chris

20. You have to write in it. (Then what?) You have to send it to him in the mail. (OK, and how do I mail it?) You would put a stamp on it. (Yeah, and then what?) And put it in the mail box and it would be sent to him. (Then what's going to happen to it?) Then the mail truck comes and he takes it. (What's he going to do with it?) He's going to give it to your brother. (My mail man is going to take it all the way to Chicago to give it to my brother, or will he do something else with it?) I don't know.

Lauren

20. You could probably air mail it. (What do I do? What are the steps?) First you write it in, then check and see if the spelling was right, and then you would put it in an envelope and write it to whatever your brother's name is, and then you'd put the address. Then you would check if the address was right and then you would close the envelope and then you would put a stamp on it, and then you'd mail it to your brother. (How do I do that?) By putting it in the mail box and then the mail man will come and get it. (What does the mail man do with it?) He takes it to the mail place and then there's this machine or something that puts it in and if there's another card to Chicago—there's tons of cards to Chicago, then they put the cards in a big old thing that can carry it by arms, and you just push it, and then you put it in a mail box or mail cart and then . . . then they'll get it to Chicago and put it in his mailbox. (OK, we got it to the post office now, and they put it in with all the other ones that go to Chicago. How does it get to Chicago?) There might be planes there and it might do air mail. (What happens then?) They would fly it to Chicago and they would drop it off at that post office, and then they'll give it to your brother. (At the post office?) I don't know. A post office in Chicago.

Second Grade

Mark

20. You could send it . . . put it in an envelope and send it to him. (How do I send it?) Like you put it with the mail and he (the mail carrier) goes to his house and then he gives it to your brother. (That's what I wanted to know. I give it to the mail man. This is a birthday card that's going to Chicago to my brother. So when the mail man takes it from me, what does he do with it?) He goes to his office and he like sorts it and then he like . . . there's these guys that like put it in something and then to Chicago and everywhere in the world, and then it goes through this little hole. It goes through and then it keeps on going until it gets to the man that goes to Chicago, and then he goes and that goes and gets to him. (That man goes to Chicago--when he gets to Chicago, what does he do? Does he take it right to my brother's house or does he take it somewhere else first?) Like he just goes to houses and houses and just keeps on going to houses, and then he looks at it and just gets the mail from it and when he gets to the house, he just takes it up and puts it in.

Emily

20. Like go to the place and mail it. A place that has mailing—you can mail it. (So what happens then?) Someone takes it and mails it to him . . . somebody takes it and drops it off to him or something in the mail.

Third Grade

Dale

20. Put it in the post office—give it to the post office. (What's going to happen to it after I give it to the post office?) They get it out of their mail box. (OK, the mail man takes it out. What does he do with it?) He takes it to your brother's house and puts it in his mail box. (So is my mail man going to take it all the way to Chicago?) No. (What's he going to do?) Mail it to another post office. (So it's going to go to a post office, and then what's going to happen?) He's going to take it to your brother's house and put it in his mail box. (How does it get to Chicago?) They could put it on an airplane and bring it there or a boat or something.

Chelsea

20. You first have to write the card and when it's all written, and you'd probably send it to another place, and you'd have to put . . . let's see, if you're in Michigan, you'd have to go through five or six states so you'd have to put like six postage stamps to get it from one place to another. You can't have just one or they'll think you're just going to one state and they'll just take it to one state, but if it was just Chicago, they'd just have to take it to their house by the mail. (But how does it work? I've written my card, I've got the

> address on it. What do I do then?) You put the six or seven postage stamps and then you take it to the post office and tell them it's going to six or seven states until you get to Chicago, and then they'll know what address it says because you've got the address on the envelope. (I leave it at the post office, right? What happens to the card then?) Oh, they'd probably read the card and they'd put it in the mail carrier thing—box, and then the guy that takes the thing to the airport . . . and it would have to fly over and over and over until it gets to Chicago and then it'll get there, and he'll get it. (It gets to the airport. Then what happens?) The plane flies over to the state and then that one drives to a different airport and it gets to that one, and then they fly to the state. (So we've got to the Chicago airport. Then what happens?) They probably drive it to the house and they put it in the mail box and he'll just come out and get it.

Grade Level Differences

Most of the categories for responses to Question 20 showed significant relationships with grade level. Younger students were more likely to be unable to respond to the question as well as to believe that the same mail carrier who picked up the card at your house would take it to Chicago and deliver it to your brother. Older students were more likely to talk about affixing stamps to the envelope or having the stamps cancelled at the post office, about you or your mail carrier taking the card to your local post office for sorting, about the sorting operations conducted there, about conveyance of the card to Chicago, and about processing of the card at the Chicago post office. Older students also were more likely than younger students to provide complete and accurate responses.

Achievement Level and Gender Differences

The categories for responses to Question 20 yielded two significant relationships with achievement level and one with gender. The relationships with achievement level included a linear one indicating that higher achievers were more likely than lower achievers to talk about sorting of mail at the local post office, as well as a nonlinear one indicating that average achievers were more likely than other students to say that the card would be taken directly to your brother's house upon reaching Chicago (i.e., to omit mention of taking it to the Chicago post office for processing there).

The lone gender difference indicated that 28 girls but only 18 boys talked about the card being taken to the Chicago post office for processing before it is delivered to your brother. This was part of a larger trend indicating that girls seem to know more than boys about the workings of the post office. In addition to the significant difference mentioned, there were nonsignificant tendencies for more girls than boys to talk about stamps, to talk about the card being taken to the local post office, and to give complete, accurate responses.

Relationships Among Response Categories

The response categories that were most strongly associated with grade level were all correlated with one another, indicating that students who talked about you or your mail carrier taking the card to the post office were more likely than other students to also talk about stamps, to talk about conveying the card to Chicago, to talk about processing the card at the Chicago post office, and/or to give a complete, accurate response. These same response categories were correlated with the maturity set of responses to the interview as a whole.

Rare and Unique Responses

The majority of students began their response to Question 20 by talking about buying the card, signing it, putting it in an envelope, addressing the envelope, and so on. These were not included in the coding because they were stated or implied by just about all of the students who responded to the question (although a few interesting things said about this part of the process are listed below).

Some students covered everything else of importance but left out the step of transporting the card from Lansing to Chicago, although this was often implied in their responses. In general, there was a progression from the idea that your own mail carrier personally delivers the mail picked up from your house to wherever it is going, through degrees of understanding of the post office as a large organization that includes many specialists besides mail carriers (sorters, people who take the mail from one city to another, etc.).

Another common response element was mention of lifting the red flag on one's mail box to indicate that there was mail to be picked up by the mail carrier. This was mentioned by no kindergarteners, five first graders, one second grader, and three third graders.

Kindergarten: Send it by computer.

First grade: Send it by computer; your mail man would take the card to Chicago but then give it to a Chicago mail man to deliver; it would be driven to Chicago, with two gas stops on the way; someone from the Chicago post office would come to get it, then take it to Chicago; your post office would send it to Chicago "after it's been there long enough" [no elaboration]; it would go on a mail boat across the lake [four other students also suggested that the mail would go to Chicago via boat or ship]; the Lansing post office would drive it half way to Chicago, then turn it over to people from the Chicago post office to take the rest of the way; your mail carrier would drive or fly to Chicago personally [one of many such responses].

Quoted as a complete answer: "You can write something down and then you can put it in a letter and put it in the mail box and the mail carrier will pick it up. (What's he going to do with it?) He's going to take it to the post office. And then they're going to put it with some other letters that are going there too. (OK, how is it going to get to Chicago?) It might go on an airplane. (OK, and then when it gets to Chicago, what will happen?) They put it in a mail box. (Who will do that?) The mail carrier. (The one that goes to my brother's house. Where will he get the card from?) The post office man. (So he doesn't get it right from the airplane—it goes from the airplane to where?) To another post office."

Another complete response: "You put it in your mail box and your mail carrier will come and get it and help put it on a plane and then they'll send it to Chicago. (OK, my mail carrier's going to take it out of my box. What's he going to do with it?) He's going to go to the airport—actually go to the post office first and stamp the letters and stuff. Then he'll take all of those letters and put them in the same box, and there's lots of boxes, and he'll put all those boxes on a plane—a special mail plane—and then the plane will take them to Chicago and the mail people there will take it to the right house. (OK, will they take it right from the plane to my brother's house or will they take it somewhere else first?) They'll take it off the plane and maybe some special mail carrier will take it to the post office and then they load them onto trucks."

Another: "You put it in the mail box and the mail man would come. He will put it in a bag and take it to the mail place and it will go through all of those contraptions—machines. After it's done, there's this big window where the back of the truck goes, and he would put it in the truck, and there's these boxes in the truck. He'd put it in like 'Chicago' and it would be mailed off. (When you say "mailed off," how is it going to get to Chicago?) If it's really far, it will go on boats or maybe airplanes. (OK, maybe on an airplane. What happens when the airplane gets to Chicago?) It will go to another mail place, get put in a truck, and then it will go to your brother's house."

Second grade: Use a computer.

"The mail man takes it and brings it to him. (He takes it all the way to my brother, or does something else happen?) He has it in a mail truck and he grabs whatever's in there and puts other stuff in the mail box, and then he goes to the mail office and puts the stuff there, and he might deliver it to him the next day." [Note that this student still thinks that the same mail carrier will deliver the card.]

Third grade: The Lansing post office people will drive it half way and give it to Chicago post office people for the second half of the trip; two students described a station-to-station [pony express] method of getting the card to Chicago; it's out of state so you will need extra stamps [goes on to suggest that you need one stamp for each state that it goes through]; your mail carrier is going to give it to another one who goes around Chicago.

The following is quoted as a response corrected on line in response to probes: "Put it in your mail box and then the mail man will take it. (What does he do with it?) He sends it to your brother. (How does he do that—where does he take it?) He takes it to his house, then he puts it in his mail box and he gets it. (Do you think my mail man goes all the way to Chicago to give that to my brother, or do you think he does something else?) He could take it to the post office and they could send an airplane instead. (OK, what happens when it gets to Chicago?) They would take it out and take it to the other post office and give it to them, and then they put it in their mail for them, and then that mail man takes it to his house."

Discussion

Most of the students were able to provide at least some details about the workings of the post office, although 10 students were able to respond to Question 20 and only 38 generated responses that we consider to be both complete and accurate. Among the 86 students who were able to respond, most began by talking about the need to get a card, sign it, place it in an envelope, address it, and put it in the mail box. After that, the students varied considerably in the number and accuracy of details they supplied about how and where the card is processed by post office personnel.

Majorities of them said that the card would be taken to the local post office, then transported to Chicago, and then processed at the Chicago post office where it would be assigned to a route for delivery. Minorities of students added other accurate details, such as that the sender would place a stamp on the envelope and the local post office would cancel the stamp and sort the outgoing mail so that the card would be placed with other mail headed for Chicago. However, some of these details involved misconceptions. One voiced by 19 students was the idea that the same mail carrier who picked up the card at the sender's house would take it to Chicago and deliver it personally. Another, voiced by 17 students, was that upon arrival at Chicago (by truck, plane, or boat), the card would be taken directly to the brother's house (without first being taken to the Chicago post office for processing). Misconceptions concerning transportation of the letter to Chicago included the idea that the Chicago post office would send someone to Lansing to pick up the card, that postal employees would travel from both Lansing and Chicago and exchange the card at some halfway point, or an extension of the latter idea that involved a modern day version of the Pony Express (station-to-station forwarding of the mail to Chicago. Finally, one third grader expressed an interesting misconception about stamps: An item of mail needs one stamp for each state that it will pass through before it reaches its destination.

As they have with many of our questions, most of the students seemed to be guided by images of postal services being rendered by just one or a very small number of individuals who handle all aspects of the work personally (the most extreme version of this being the notion that the same individual picks up the card at the sender's house, travels to Chicago, and delivers it at the brother's house. Few if any of the students had yet developed images of the post office as a huge organization that employs hundreds of thousands of people who each work on just part of the sequence of steps involved in picking up mail, checking it for adequate postage and canceling stamps, sorting it by destination, transporting it to the destination, transporting it upon arrival to the appropriate local post office, sorting it there by mail route, and then delivering it.

Knowledge About Newspapers

The next two questions addressed the students' knowledge about newspapers, including why people read them (what is in them) and how they are made.

Question 21. Let's talk about newspapers. Why do people read newspapers—what's in them? . . . What else is in the newspaper? (If no response: **Does someone in your family read the newspaper? Why does ______ read the newspaper?)**

Question 22. How is a newspaper made? . . . What do they do first? . . . Then what? . . . Etc. Take whatever the student says and probe forwards or backwards from there, but in particular, see if the student knows (1) who decides what words to use and how they compose their stories (e.g., get the news and then type a report into a computer) and (2) how this is made into a newspaper (e.g., printed on a printing press.)

All but seven of the students were able to say something about why people read newspapers (Question 21A), that the most common responses being that they read it to get news in general (news, information, important stuff, stuff that people should know, etc.) (49), news about sports (44), and information about the weather (33). Other features of newspapers mentioned by smaller numbers of students included puzzles, comics, and other entertainment features (24), advertising (supermarket specials, furniture or auto sales, classifieds) (19), announcements about special events and information about television programs and theater showings (19), and death notices (12). If students who talked about reading the paper for news items gave examples of such items, these were coded for whether they focused on good news (human interest stories, reviews of new entertainment choices, etc.) or bad news (disasters, crime, tornado warnings, etc.). Results from this coding indicated that 9 students gave examples that were exclusively good news, 19 gave examples that were exclusively bad news, and the rest gave some of each. Overall, the students showed generally good knowledge of what is in newspapers and why people read them.

When asked who in the family reads newspapers (Question 21B), six students could not respond but the rest mentioned one or more people. A heavy majority (80) mentioned the father or another male relative and more than half (49) mentioned the mother or another female relative. In addition, 21 students said that they read (at least part of) the newspaper themselves, 9 said that family members read the newspaper when they miss or do not watch the news on television, and 7 indicated that their mothers or other female relatives focused on different parts of the paper than their fathers and other male relatives. When asked how newspapers are made, 10 students could not respond but the others suggested one or more steps, most typically that someone uses a pen, pencil, typewriter, or computer to compose text (64) and then this text is entered into a machine that stamps, prints, or makes multiple copies for distribution. Other steps mentioned by smaller numbers of students included making the paper from wood (21), going to a site to gather news (15), getting the news from television and writing a report of it for the paper (12), adding illustrations to the written text (16), and delivering the paper to people's homes (24).

In addition, 4 students mentioned that the originally written story would be given to an editor or rewriter who would render it into the version that would appear in the paper.

In talking about how a newspaper is made, the majority of students mentioned writing or typing the text and/or printing it, but not gathering the news or editing the copy. Only 15 students mentioned gathering the news, and of these, only four clearly understood that the newspaper employs reporters who personally go out to observe or do interviews to get news. The others were vague about the process. Furthermore, another 12 students clearly thought that the people at the paper get the news from television, and another 5 thought that news items are received from people who phone or send them into the paper, so that the paper's employees merely take what is brought or called into them (as opposed to going out to gather news). Many of the responses coded in Category 6 for responses to Question 22 (a machine prints, copies, or stamps the paper) or "black box" responses, in which the student talked about the paper being printed but could not actually say anything specific about it. Other responses in this category used a photocopier analogy, and still others showed some knowledge of typesetting and printing (or "stamping," as many of them called it).

Overall, most of what most students had to say about newspapers was accurate and free of misconceptions. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

> 21. Like if you're looking in a newspaper and you want to go to the movies, then you'll see it in there. (OK, so there's ads telling you what movies are playing. Anything else that you might find in a paper?) No. I don't know.
>
> 22. They make paper. (OK, they make paper. So then you've got the paper. Then what?) I don't know.

Kate

21. I don't know.

22. I don't know.

First Grade

Chris

21. Things they don't know but if they wanted to know, they read it. (OK, like what things?) If there's a fire that got started last night and they wanted to know, and they would put it in the news and send it to everybody. (OK, so there's news in the newspaper, like fires. What else is in the newspaper?) If there is a tornado that's heading close to everybody, they would tell them. (OK, so weather news. What else?) I don't know. (Do you ever read a newspaper?) NO. (Does anybody in your family?) My mom and my dad and my grandma and grandpa. (What does your mom like to read in the newspaper?) I don't know. (How about your dad—is there something he likes to read?) He likes to read the prices of trucks and cars.

22. They chop down a tree to make it—chop all the trees to make it. (OK, so they make paper. Then what?) They print it on a big machine and they send it to everybody in the mail. (OK, but what happens before it gets printed? How do they know what to print?) Because it happened and they know what to say. (OK, so somebody finds out about what happened and writes about it.) Yeah. (How do they write about it?) They print it out. (They're the ones doing the printing?) They print it on a printing machine. (Do they give something to the printer or what?) I don't know.

Lauren

21. So you know what's happening. Like there's a ball game and you didn't watch it and you could tell who wins or who wins it for the whole game. (What else is in the newspaper?) Um . . . information about things. (Is there anything else in the newspaper?) Things that are going to happen like next week or tomorrow. (Does someone in your family read the newspaper?) Yeah, my dad does. (Why does your dad read the newspaper?) Cause he wants to know what the weather's going to be like on Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday, and he also reads other parts, like the sports. He really likes to read those.

22. By old papers. It recircles into newspapers. And then after the newspapers are done, they're made into different kinds of paper, and it goes in a circle. (But what do they do first to make a newspaper?) First they write it and for the weather they copy it off the weather channel. Then they write it on a newspaper and they give it to someone else, and the other person writes lots more than just the weather. (What happens then?) Then it

goes to some people that gives the newspaper to everyone. (How do they get enough papers to give to everybody?) They keep on copying and copying. They copy it like a copier machine that copies . . . they make one and then they know what to write on the other ones and it copies it, and then they stamp it on a paper and then it goes to the other machine.

Second Grade

Mark

21. So they know what's happening. Like there might be a new show that you might like or that you think your child would like. (Do you mean a TV show or a movie?) Yeah, or maybe like if there's a thunder storm or something. (So there's weather news an there's news about new shows. What else?) Like if you forgot to watch the football game or the basketball game, then it says about it. (The sports news. Anything else in the paper?) Like there's the president. (So news about the country and stuff.) Yeah. (Do you read the newspaper?) No, my dad tells me. (Does he read it for any reasons besides the ones you told me already?) Mostly he just wants to solve the puzzle on the back and he might want to look at the stories about the Simpsons and that. (OK, so there's puzzles and there's stories about TV.) And he might want to read about the basketball game. He just wants to read about the games.

22. They like get a tree and do something with a tree, and then paper comes out and then you like write stuff on the paper, and then you send it to people. (OK, but let's back up to where you got the paper and you want to turn it into a newspaper. Do they just write on it or what do they do?) They make the shape of a paper and then they like put it through a machine and it'll turn into a paper. (What does that machine do to turn it into newspaper?) They might like soften it up and make it kind of straight and put white stuff on it and when it dries, they might like just do something like push it down (i.e., flatten it), and then it just goes through and it's like done. (OK, you've blank newspaper, nice white newspaper, but there's nothing on it yet.) I know. You write on it. (The newspaper at home—does it have pencil and ink on it or what?) You might like print it. (OK, so it's printed. Where do they get the stuff that's printed? How do they know what to print?) Cause there's like this guy that like looks at every game to see who wins, and he's the man who like knows who won and stuff, and then knows what to put. (OK, for sports, there's someone who gets the information together.) Yes. (Then what does he do?) He like tells them what to put in the sports. (I see. Then what do they do after he tells them?) They might like print it on the newspaper. (OK, so somebody tells them what to print, and then they fix the printing somehow and print it. Is that what you're saying?) Yeah. (Do you know anything more than that?) No.

Emily

21. Because they want to know what's happening around. (What else is in the newspaper?) The weather, what it's going to be like. (What else?) Cartoons maybe. (Does someone in your family read the newspaper?) Yeah, my mom and dad. (Why do they read the paper?) Cause they want to know what happens and stuff.

22. From wood, like on trees and stuff. (Yeah, that's the paper. But how does the news get in it?) I don't know. (Who decides on the stories?) I don't know.

Third Grade

Dale

21. To find out news that goes around the world. (OK, so there's world news in them. What else is in the newspaper?) The sports page. (Sports news, right. Anything else?) I don't know. (Do you read a newspaper?) Yeah. (What do you read?) The sorts page. (Is that the only thing?) Yeah. (Does anybody in your family read it?) Yeah. (Who?) My mom. (What does she read it for?) To find out what's going on. (Anything else?) I don't know.

22. Print black ink on it. (OK, but how do they know what to print, though?) I don't know.

Chelsea

21. So they can find out what's going on, what the weather's going to be like, what's happening—if anybody's got injured, or if they just want to read it. (What's in newspapers?) The weather cast, what's happened to kids or families, about fires and kids. (OK, so weather and news. What else is in the newspaper?) Probably new stuff they invent and probably stuff they've done. (Who's done?) Really famous people. Like if the president got fired or something. (Does anyone in your family read the paper?) My brother has to because my dad makes him. My dad does and my mom does, and sometimes I do because I found out about the kid that got stuck in the trees and got cut up in the wood chipper. (Why do the people in your family read the newspaper?) Probably because they want to find out what's going on so nothing happens at the house or nobody's going to get hurt or anything like that.

22. By printing presses and like by an editor. Sometimes they can be in schools. (What does the editor do?) It writes an article and they print it into a newspaper and then they just send it all out and make copies of them.

Grade Level Differences

Most of the categories for responses to Question 21A showed significant relationships with grade level. One was nonlinear: second graders were more likely than other students to mention exclusively bad news when they gave examples of items likely to be found in newspapers. Otherwise, the younger students were more likely to be unable to respond to the question and the older students more likely to mention good news examples, advertising, announcements, sports, weather, and entertainment features.

Analysis of responses to Question 21B indicated that older students were more likely than younger students to read the paper themselves and more likely to say that their mothers and fathers read different parts of the paper. A third significant relationship with grade level is puzzling: Third graders were less likely than younger students to say that their fathers or other male relatives read the newspaper. This difference was unexpected and we have no firm interpretation for it. Furthermore, it is a barely significant difference in the degree to which the third graders showed the same tendency as the other three groups, not a more sharply delineated stark difference. It is possible that fewer third graders mentioned fathers because fewer of them have fathers in the home: As time goes on, more marriages dissolve intc separation or divorce and most children stay with their mothers, so it is likely that more of the third graders we interviewed lived in father-absent homes than was true of the younger students (although we do not have such information).

A nonlinear relationship with grade level also appeared for one of the categories for responses to Question 22: More first graders than other students mentioned adding illustration to the text in talking about how newspapers are made. Otherwise, the younger students were more likely to be unable to respond to this question and the older students were more likely to mention the steps of going to sites to gather news, writing the basic text of the article, printing the article to make multiple copies of the paper, and delivering the papers to homes. Overall, the older students knew more than the younger ones about what is found in newspapers and how newspapers are made.

Achievement Level and Gender Differences

This set of categories yielded seven significant relationships with achievement level and six with gender. Two of the relationships with achievement level were nonlinear: Average achievers were more likely than other students to talk about people reading newspapers to get information about the weather and about reading death notices. Otherwise, the significant relationships with achievement level indicated that the higher achievers were more likely than the lower achievers to mention the entertainment features of newspapers, to say that their mothers read the newspaper, to say that they read the newspaper themselves, and to talk about the paper being printed to create multiple copies. Higher achievers also were less likely than other students to talk about adding illustrations as part of the process of creating the newspaper. The latter relationship is not surprising because many of the "illustration" responses were made by students who held relatively unsophisticated ideas about the making of newspapers (i.e., imagining people writing text and making illustrations with pen or pencil rather than typing with typewriters or computers and including photos or other illustrations developed using technology).

Gender differences in responses to Question 21A might have been predicted based on what is known about gender role socialization. Boys were much more likely than girls to talk about people reading the newspaper for sports news, and also significantly more likely to talk about taking advantage of the puzzles, comics, or other entertainment features. Meanwhile, there was an almost significant tendency for more girls to talk about reading the advertisements.

Analyses of responses to Question 21B indicated that more boys than girls were unable to say who reads newspapers in their families, whereas more girls than boys said that the newspaper is read by their father or other male relatives. Finally, analyses of responses to Question 22 indicated that more boys than girls said that the people who write newspaper articles get their information from watching television but more girls than boys mentioned the step of writing text using a pen, pencil, typewriter, or computer. None of these differences were expected or seem connected to gender role socialization. Overall, there was no indication that either gender knew more than the other about newspapers.

Relationships Among Response Categories

Students who cited human interest stories or other good news items as examples of what is found in newspapers were more likely than other students to have provided accurate responses to the earlier question about words we use today that didn't exist 50 years ago, and in particular, to provide responses focused on popular culture. In contrast, students whose examples of what is found in the newspaper focused on crime, warnings, disasters, or other bad news were more likely than other students to say that people read the newspaper mostly only when they miss or do not watch television news programs and also to say that television changed the world by allowing people to watch sports and entertainment programs (i.e., no mention of news programs). It should be noted that seven of the nine students who focused exclusively on good news were third graders, whereas students who talked about news in general or focused primarily on bad news were spread more evenly across the grade levels.

Students who spoke of reading newspapers for the advertising were more likely than other students to say that mothers and fathers read different parts of the newspaper and to know that companies pay television stations to broadcast their advertisements.

Students who spoke of reading newspaper for the sports articles were more likely than other students to have given technical terms as examples of words that we use today that were not used 50 years ago, as well as to say that television changed the world by allowing people to see the events being broadcast (i.e., in particular, sports events). These might be considered "masculine" responses to the questions involved.

Students who talked about reading newspapers for weather information were more likely than other students to have answered Question 2A by saying that people need to communicate in emergencies or when something may be harming them, to have said that the Eskimos' language has more words for snow than ours because Eskimos live in a more snowy environment and spend more time in snow, and to say that radio changed the world by making it easier for people to get weather forecasts or warnings about storms or tornados. Thus, students prone to make these responses appeared to be students with particular interests in weather and/or concerns about weather-related dangers.

Finally, students who said that they read the newspaper themselves were more likely than other students to be coded in the maturity set of categories for responses to the interview as a whole.

Rare and Unique Responses

Question 21

Most responses to Questions 21A and 21B were well represented by the coding categories. Only two students said that no one in the family reads the newspaper. When students themselves reported reading the paper, most said that they only read the comics or looked at the photos (the older ones often mentioned sports). The nine students who said that they look at photos were relatively evenly distributed across the grades.

Kindergarten: None.

First grade: Has read about strikes at General Motors and about the stock market; examples of news items include birthdays of famous people, new towns getting started, and bands coming to town to give concerns.

Second grade: The newspaper contains information about things not covered on the television news; you read a newspaper to know more than you would know from just watching television.

Third grade: Newspapers contain magazines and lost and found notices, especially for pets; the student read about the Arkansas shooting; the student has read about laws, such as the need to be 16 years of age to get a driver's license; the newspaper reports on new things that get invented and famous people, "like if the President got fired or something;" the newspaper tells you if someone has a new baby; the student has read stories about pets and garage sales.

The most complete response came from a third grader who told about reading the kids' contributions (the local paper prints essays and stories written by children in a special section that appears once each week). This student also made reference to the national news section and the state news section, talked about looking at the temperatures in other places, and recalled reading stories about Hiroshima and about a new type of food.

Question 22

Several students talked about the characteristics of the paper on which newspapers are printed. Four said that this paper is old or scrap paper, two referred to it as gray, and three talked about it as recycled. Four teen students mentioned involvement of a computer somewhere in the process of making a newspaper: one kindergartener, three first graders, six second graders, and four third graders.

Kindergarten: They use stamps to print it [this and one other student seemed to think that the printing is done with wooden blocks, letter by letter, rather than with printing machines]; student described wrapping the paper in plastic and other preparation for sending it out for delivery, claiming to know a lot about how papers are made from reading a book about it.

First grade: Described the process of going to the newspaper office to place an ad; people call or send in the news to the newspaper [this same response was made by three second graders].

The following first grader is quoted as an example of a student who has the concept of printing without the vocabulary: "First they have to cut down trees and make the paper, then they have to type all the stuff in a machine and then put pictures on it. Then they send it to a place where a special guy comes by and you take it. (You said they type it. When they type it, does it look like this page [referring to the typed interview questions]?) No, it's smaller letters. (So how does it get to be that way?) They just have smaller letters on a machine where it makes it small, but they use the same one as for books, but they make it change the size of the letters . . . they can change the shape that it is and the size of the letters."

Second grade: They make paper by chopping wood into tiny pieces; student describes the pictures as drawings rather than photos; editors decide which stories to use; when asked who decides what to put in the paper, says "I think the President."

The following second grader is quoted as an example of imagining the newspaper as receiving rather than gathering news, but also as exercising editorial discretion: "They take things that they know and they call up the printing press and tell them that they want to put something in the newspaper. The newspaper people ask what it's about, and they tell them, and if it sounds interesting to them, they say "OK," and you have it written down on a piece of paper and tell them what you want to say in the newspaper and it goes into this one machine that prints the article out and then it goes into another machine that prints it on the newspaper. (How do you know all that?) I think I saw it on this one show."

Third grade: Mentions proofreading and correcting the text before sending out the paper; the newspaper people watch TV for the news and the weather and they either get comics from the cartoons on TV or they think them up themselves; when asked how the typescript becomes newspaper, says, "They dip it in hot water;" talks about calling the newspaper to place an ad.

The following third grader is quoted as one of the better responses: "They collect news from around the town and take it to a printing press and then print it and then give it to some deliverers and they deliver it. (You said they collect news and take it to the printing press.) Maybe there was an accident that happened and they would get some details about it. (OK, then what do they give the printer?) They give them the notes they might have written down."

Another good response: "First they have to find some news somewhere, then they have to write it, and then there's this guy called the editor—he sees if it's good enough for news and he checks all the work to make sure it's not spelled wrong. If it's good enough and it's not spelled wrong, he'll take it to a place called the press where they sometimes type it up on this one kind of paper. They put it in and put all the stories and stuff into these papers and then they put it into a packet and it's called the newspaper."

Discussion

The students' ideas about newspapers were generally valid as far as they went, although most were vague about how stories originally written or typed on ordinary paper become incorporated into a printed newspaper. Also, only a few students understood that newspapers fulfill unique functions by covering a much greater range of information than is covered on the television news and going into greater depth on the material covered in common. Furthermore, some students thought that the newspaper gets all or at least most of its content from television and that it functions primarily as a source of news for people who do not watch news on television or a backup mechanism for people who miss their usual news program on particular days.

It is also noteworthy that most of the students were unaware of the newsgathering function of newspapers. Only 15 students made any reference to newsgathering and only a handful of these clearly understood that newspapers proactively develop stories rather than just take down what people tell them. Most students viewed newspapers as supplements to television news read not so much for hard news content as for sports, features, weather information, and local advertising and announcements. This view would have been clearly inaccurate 50 years ago and mostly inaccurate even 25 years ago, but today it is probably more accurate than not for all newspapers except the *New York Times*, the *Washington Post*, and perhaps a dozen others that invest significant news-gathering and editorial resources on reporting that extends beyond the scope of local news. Even the misconception that newspapers get much of what they print from watching television news broadcasts is not all that inaccurate: Much of the content of most newspapers is reprinted or edited from receiving input rather than developed and written originally by the paper's own staff. The only difference from the children's version is that this input comes primarily via computer from the associated press and other centralized news distribution services, rather than from television.

In summary, although the students were mostly fuzzy or confused about the processes and technology involved in creating a newspaper from written or typed copy, they had generally accurate ideas about what is found in newspapers and why people read them. Most of them clearly subordinated newspapers to television as the primary source for information about major news and depicted newspaper employees primarily as receivers (and in some cases, editors) of information that comes into them, rather than as people who proactively go out and develop stories. They viewed newspapers primarily as sources of entertainment and information about local sports, weather, and shopping or leisure time options, along with coverage of events not significant enough to be covered on television. No student mentioned editorials, and only a few suggested that newspapers provide more in-depth coverage than can be found on television. Thus, the students' view of newspapers was a far cry from traditional journalistic ideals, but probably realistic given the changes that have occurred in the newspaper business in the United States over the last 50 years, and especially in the last 20 or 30 years.

The Nature and Impact of Broadcast Media

The next several questions assessed students' understanding of radio and later television as inventions that changed the world in fundamental ways, then asked what is involved in televising an event and broadcasting it nation wide.

Question 23. An important invention at the time was radio. How did radio change the world? . . . What did radio bring to people that they didn't have before?

Question 24. Another important invention was television. How did television change the world? . . . What did television bring to people that they didn't have before? (If it seems worth doing so, probe to see if the student has any understanding of how these inventions made instantaneous mass communication possible and eventually shrunk and homogenized the world.)

Question 25. Let's talk about how television works. Suppose one of the astronauts came here to your school to talk to the kids. Now if Channel 6 found out about it, they would say, "Wow—that's big news! One of the astronauts is coming to talk to the kids at the school. Let's show that on our six o'clock news!" What would they have to do? (If necessary **"What would a TV station have to do to show that on their news program?)** [Probe to see if student understands that the station would have to come to the school and videotape the talk, then take the tape to the station to edit. Also, see if the student has any explanation for how the tape then is "put on TV."]

Question 26. Besides the news, television brings us entertainment shows like Cosby, or Jeopardy, or Star Trek. What's your favorite show? . . . OK, let's take _______. Where do they make __________, and how does it get to us, on our TV? (Probe for details, especially to see if the student understands that the shows are taped in Hollywood or elsewhere, then later broadcast through a network to local stations. If the student says that they make videos and then send them to local stations, ask about live shows, such as sports events, that we can watch as they unfold.)

When asked how radio changed the world, 18 students were unable to respond but 62 said that radio enabled people to listen to music at home and another 40 said that it brought people news and announcements. Smaller minorities of students said that it brought weather forecasts (22), sports broadcasts (7), or other things such as commercial advertising or dramas and other entertainment shows (12). All of these responses were accurate, although they reflect students' familiarity with the radio of today more so than an appreciation of how radio changed society when it was first introduced and popularized. In particular, only a few students were aware that prior to television, radio provided drama, situation comedy, and other nightly entertainment programs and served the same general functions for people that prime time television serves today.

All but eight of the students could respond when asked how television changed the world, and a heavy majority (69) of them noted that television allowed people to see in addition to hear what was being broadcast. In addition or instead, minorities of students noted that television brought cartoons (28), mentioned both entertainment and news shows (36), mentioned entertainment shows but not news or weather information (22), mentioned news or weather reports but not entertainment shows (10), or mentioned that television allowed people to witness events without being there (13) or to learn things from educational shows (6). In addition to these responses referring to broadcast television, 16 students said that the invention allowed people to watch videos or movies at home. These responses also were accurate as far as they went, although they reflect the child's (as contrasted with the adult's) perspective on the medium in their emphasis on cartoons and other entertainment shows over news and information shows.

When asked what a local television channel would have to do in order to show an astronaut's visit to the school on the nightly news, 30 students were unable to respond. However, most of the rest were able to say that the station would send personnel to the school to videotape the astronaut speaking to the students and perhaps interview the astronaut or some of the students, then take the tape back to the station for inclusion in its nightly news broadcast. In trying to explain how this would be accomplished, a majority of these students could only offer

BEST COPY AVAILABLE

vague statements about how they would "show it" or "put it on TV." However, minorities of the students said that the videotape would be taken back to the station (23), edited (8), and then played on a VCR or VCR-like machine to broadcast it (21). In addition , 18 students noted that the news anchor would talk about the astronaut's visit as the tape was being shown on the newscast.

Finally, when asked how they are able to view their favorite shows on their television sets at home even though the shows originate from somewhere far away, 30 students were unable to respond but the rest generated responses that addressed the question in varying degrees. About a third (31) of the students talked about the processes involved in making their favorite show (some of these were quite well informed, especially responses concerning the making of cartoons). In addition or instead, some students addressed the issue of how the show reaches the television sets in the homes of the viewers. The most popular idea was based on the notion of electricity traveling through wires (variously described as electric wires, phone wires, power lines, or cable lines), which was mentioned by 39 students. Much smaller numbers of students mentioned signals transmitted through the air (with references to satellites, radio waves, radio dishes, or antennas (9), suggested that the show was being taped by a camera or VCR that was somehow connected to all of the televisions in the country (7), said that the show is videotaped and then the tapes are sent to local stations where they are played for local viewers (6), or else made vague reference to a video camera or tape machine being involved but could not explain anymore explicitly (6). Cable television is well entrenched in the area, so most if not all of the 39 students who mentioned electricity traveling through wires received television programming in their homes via cable rather than previously conventional antennas or satellite dishes. Thus, their responses would have to be considered correct as far as they go. Still, the larger pattern of responses to this question makes it clear that very few of the students understood that the most basic method of transmitting television programming is through broadcasting of signals via waves that travel through the air to antennas or other receivers rather than through electronic connections running from the source of a televised event to the homes of the people viewing it.

The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

23. I don't know.

24. I don't know.

25. They would have to make wires—the TV wires, where it would go through (What else would they have to do?) I don't know.

26. I don't know.

Kate

23. I don't know.

24. Because they could watch shows instead of going to the movies. Only the news shows are the ones you go to see at the movies.

25. I don't know. (Do you have any idea how a TV station gets their news?) No.

26. They put them out in video stores and we can get it to watch.

First Grade

Chris

23. Instead of sending paper to everybody and chopping down trees, they could send it by talking to them.

24. They could tell you and you could watch the person and show you what was happening instead of listening.

25. They would have to go see them, listen to him talk to them. (So they would just come and talk with him?) Yeah. (Well, how would they be able to show him talking to the kids?) He would go from class to class to see everybody. (Right, and if the TV people wanted to show that on their newscast, what would they have to do?) I don't know.

26. (Where do they make a program like Rug Rats and how does it get to us on our TV?) They draw the pictures, and they have to get people to do the sound of their voices and their characters. (Where do you think they do all this?) I don't know. (Do you think it's right here, or is it far away somewhere?) Far away. (So how come we can see it here just by turning on our TV? How does it get to us?) They show it on television. (Yeah, but how does that work?) I don't know. They put it on TV. (How do they do that?) They show it on this machine that comes through the TV [couldn't explain further].

Lauren

23. Cause you could listen to music and stuff. (What did radio bring to people that they didn't have before?) They could listen to things like songs.

24. You never got to watch things that were happening, like shows. Now you get to watch shows. (What did television bring to the world that they didn't have before?) They could watch things like shows.

25. They might have to videotape it . . . like put a tape in the VCR and then show it on the news.

26. I don't know where they make Pooh Bear. (Well, let's say it's Florida or California. How do we see Pooh Bear on television when it's made in Hollywood?) Cause it goes by electricity to everyone's homes and that's how we can see it.

Second Grade

Mark

23. So they could make like songs and they could make sounds and see what they sounded like.

24. So they didn't have to go to the game. They could always just watch it on the TV instead of going all the way to it. Like something might be in Chicago and you could just watch it on TV.

25. The camera guys might go to the room and take a picture and then like show it on there. (OK, then what would they do?) They put it on TV so everyone would know and watch it. (Do you know anything about what it means to say they would put it on TV—what they'd actually do to put it on TV?) They would take the picture and then they'd put it I a little box or something or put it to the side and then when they turned the TV on, when they want it there, it's there because they want it to be on TV. And it's there when they put it on.

26. There's like these wires in the street and when you want to watch it, you turn to the channel and the wires are hooked to your TV, and then the wires to go your house, and it's there so you can watch it.

Emily

23. I don't know.

24. I don't know.

25. I don't know.

26. I don't know.

Third Grade

Dale

23. By telling people what was going on. (OK, so it brought the news. Did it bring them other things that they didn't have before?) It told them about sports. (Anything else?) I don't know.

24. You could see what the weather was and the news. (What else did television bring people that they didn't have before?) Nickelodeon

25. Take a camera there and tape it and put it on.

26. It travels to the cable lines. (OK. Do you know any more about that?) No.

Chelsea

23. It's easier to communicate. All they do is have to listen, but if they're deaf it'd be hard because they wouldn't know what's going on, but you'd have eyes and you could read it in the newspaper, but sometimes they don't have it in the newspaper. (OK, there's news on the radio. Is there anything else on the radio?) Music and probably warnings telling them stuff, having contests to win stuff—that kind of stuff. (What did radio bring to people that they didn't have before?) Electricity and they could listen to stuff, so if they got bored, they could just turn it on and listen to the music or listen to what's going

on. (What did they do before that?) They just . . . the person would find out if they knew a lot about the weather—they'd find out and tell it to everybody and everybody would pass it on to each person that's there in the world,--in their state and the country.

24. It's easier to see stuff, but sometimes there's Spanish for people to understand, and English channels, and there's kids' channels. If you only had the news, that'd be pretty boring for kids. (But how is it different from radio?) It's bigger and you can see what's going on—what they're saying, and they can make sure everything's OK and nothing's going to happen to people or anything like that.

25. They'd have to explain what was going on and they'd have to have a video camera showing them talking to kids cause they can't just say that because some people might not believe it. So they'd have to say what was going on and show the film that they filmed of the astronaut talking to the kids. (So they've filmed it. So what do they do with the film? How do they put all that together?) They turn it into one film by connecting it together to make one big film and then they just put it in with the person on it, but the newscaster and they just show it on TV and everybody knows that's happened. (How do they show it on TV? How does that happen?) IN a studio with all these cameras all around and some of them show in Spanish and some of them just show it in USA, but when they do that, they're just sitting there in the studio talking about what happened and they've got a big TV behind them and then it shows the film on it, and to show the forecast, they've got a big green TV screen thing, but it's not hooked up to anything and they just click it and then they can see what's going on on the TV cause they can see the map, but on the green thing, you just see green. That's all. (How does that get into your house?) By going through . . . when you turn on the TV, the electricity goes around to the TV and stops and when you change the channel you'll be able to find it and they'll stop right there and you'll get to see them on TV and see what they're doing.

26. Nickelodeon studios and it travels on and on all around the world. (How does it get from the Nickelodeon studios to us?) I don't really know.

Grade Level Differences

Analyses indicated that the younger students more often were unable to respond to Questions 23-26 and the older students more often generated the most sophisticated responses. Responses that were less directly relevant to the question or less sophisticated as answers to it tended to show no significant relationships or significant but nonlinear relationships with grade level. The older students were more likely to say that radio changed the world by bringing people music, news and announcements, or "other" programming, and to say that television brought people both entertainment and news programs, allowed them to witness events without having to be there, and allowed them to see in addition to hear what was being broadcast. Concerning a local television station's inclusion of an astronaut's visit to the school on their nightly news, older students were more likely than younger students to explain that station personnel would come to the school to tape the visit, as well as to go on to either make vague references to showing it or putting it on TV or to make more specific references to taking the tape back to the station, editing it, and then broadcasting it with commentary by the news anchor. Surprisingly, however, the response explaining that the tape would be played on a VCR or VCR-like machine in order to show it during the news broadcast (which appears to be the most sophisticated of the response categories) showed a nonlinear relationship rather than a linearly positive relationship of grade level. Finally, the only category for substantive responses to Question 26 that showed a significant relationship with grade level was a positive relationship for references to broadcasting via waves transmitted through the air. Five of the nine students who made this response were third graders.

Achievement Level and Gender Differences

This set of categories yielded only four significant relationships with achievement level, as well as seven with gender. The achievement level relationships were all positive ones indicating that higher achievers were more likely than lower achievers to say that radio brought people weather forecasts, that television allowed people to see as well as to hear what was being broadcast and led to the invention of videos that allow us to watch movies at home, and that the local television station would send personnel out to the school to videotape the astronaut's visit.

There were no gender differences in explanations of how radio changed the world, but more boys were unable to respond to the question about how television changed the world, whereas more girls said that television allows people to watch movies at home on videotape. The categories for Question 25 yielded three gender differences: Girls were more likely to be unable to say what the local television station would have to do in order to show the astronaut's visit on their news program, whereas boys were more likely to say that the station would send personnel out to tape the visit and that the videotape would be taken back to the station. Finally, when asked how we are able to view television shows that originate from far away, boys were more likely to make mention of transmission of waves through the air but girls were more likely to say that the programs are videotaped and the tapes are then sent to local stations. In general, the gender data suggest that there were few differences between boys and girls in their understanding of how radio and television changed the world, but that boys knew somewhat more than girls about how television programs are made and broadcast.

Relationships Among Response Categories

Three of the responses to Question 25 (the station would send personnel to the school to videotape the astronaut's visit, the tape would be taken back to the station, and the tape would be edited) tended to correlate with one another and with a correlated cluster of responses to a later question about e-mail (e-mail works on the computer, e-mail is faster than regular mail, typing e-mail messages is easier or neater than writing letters by hand, and e-mail doesn't involve putting the message in an envelope, taking to a mail box, or other hassle involved in traditional mail). Thus, this cluster of responses might be considered a manifestation of special knowledge about technology on the part of the students who made them.

Otherwise, the only noteworthy intercorrelations involving responses to Questions 23-26 were positive relationships between certain categories and the maturity set for the interview as a whole. Responses that composed part of this maturity set included: "Other" responses about how radio changed the world (made by students who knew more about early radio than other students), television allowed people to see in addition to hearing events being broadcast, television brought people both entertainment shows and news/weather reports, and the television station that wanted to show the astronaut's visit would need to send out personnel to tape the visit, bring the tape back to the station, put it on TV somehow, and have the news anchor describe the visit as the video was being shown. We were surprised that the maturity set did not include the response that people at the television station would play the videotape on a VCR or VCR-like machine in order to show it during the newscast, just as we were surprised that this response showed a nonlinear relationship to grade level rather than a significant positive relationship. Apparently, most of the responses coded in this category were less sophisticated than the category label suggests. Inspection of its correlations with other response categories showed a few relationships with highly sophisticated responses (e.g., knowledge that companies pay TV stations to broadcast their commercials), but many more correlations with only moderately sophisticated responses, often responses that missed the main point of the question (e.g., Indians didn't have libraries because they lacked the materials or knowledge needed to build them) or that contained a misconception (e.g., the chief wanted to send a message to the chief of a village five miles away would send someone carrying a written message).

Rare and Unique Responses

Question 23

Many of the students thought of radio as just music, often used as something to put on in the background or provide something to do if you are bored. Most of their responses were well captured by the categories.

Kindergarten: None.

First grade: Student talked about car radios and listening to the radio in the car; radio allowed people to hear things from far away places; you could have a portable radio and take it outside.

Second grade: You could get laughs from comedy shows; radio stations have contests and listeners can call in for prizes. [Three third grades also made this response.]

This second grader was aware of entertainment shows on the radio in the past: "Back when there were lots of stories from Shakespeare and those things, there were like these little short stories like 'Once upon a time a so and so person like a detective was . . . and then all of a sudden . . . (So you think on the radio they had shows like that too.) No, little stories, because you couldn't really like see the pictures, and they used other things like to make the sound of effect of shoes tapping, they could [makes the sound effect]."

Third grade: You could hear things from far away places; radio made it easier to get information—you could just listen instead of having to read, and this was especially good for blind people.

BEST COPY AVAILABLE

Question 24

Many students had difficulty comparing television to radio because they lacked a clear idea of what radio was like in the pre-television days. Several students said that television is good if you are bored, tired, or looking for some variety, and several others (probably students whose parents placed tight restrictions on their viewing) suggested that television makes you lazy, tempts you to watch junk like wrestling, and so on.

Kindergarten: After television, people could go on TV.

First grade: Commercials.

Second grade: Serious people didn't like TV because their kids were watching wrestling and stuff; with TV, you could not only read about sports but get to see the highlights of the games.

Third grade: TV brought Nintendo and other video games; TV allowed us to know that the news people weren't lying to us; TV has channels in other languages and you could try to learn those languages by watching those channels; TV brings us news faster than a newspaper, and you can see it happening; TV brought commercials; kids often want to keep watching TV instead of starting their homework.

This third grader is quoted at length for her particularly good response: "It changed the world by making almost everybody lazy. Most kids I know love it, of course. The television brought news even quicker than the radio and newspaper, so the news. They got the idea for that from the newspaper and the radio and stuff like that. Then they decided if they wanted news fast, they could just turn it to a channel or something and listen to the news. (What else did TV bring to people for the first time?) It brought cartoons and stuff like that. It made kids happy by cartoons, and then they invented the VCR. I have no idea what that stands for. (Why was TV better than radio?) Because then you could see stuff. You didn't have to imagine what it looked like. You could watch what it looked like instead of having to just imagine."

Question 25

Although most students understood that the event would be videotaped, most were vague about what had to happen after that in order to get the video onto the newscast. Some had the general idea but lacked vocabulary. Others were persistently confused by the notion that the tape might be sold in stores and played on VCRs.

Kindergarten: The police might take pictures of the event and send them to the TV station [note parallel to newspaper responses depicting people sending in the news rather than the newspaper sending out reporters].

First grade: Described what sounded like a television control room with a big screen and several monitors showing different content. The following is quoted in its entirety as a typical response for the younger students: "Videotape it and put it in the TV and then it can go on the news."

The following is quoted as a good response by a first grader who lacked much technical vocabulary: "They would have to go to the school and report it and someone has to be there and they put it on a video camera and someone would be talking to the astronaut and they would show it at six. (How would they show it on the six o'clock news?) They would go there and they would tape it and they would have like a tape recorder and they would put it in the tape in a TV and they would show it. They would tape and they would have talk and pretend that they were there already. (How can they put it on everyone's TV all at the same time?) They switch the cables around and you can see, like one cable is pointed that way and they're not supposed to do that, and one person moves it over and the other person moves it over and watches the TV, and they think he's really there, but it's a video. (But how does the tape get put on TV?) They put it on that thing and push 'play' at the TV station."

This last first grader is quoted because her response includes a version of the "the big one supplies the little one" theory that we have seen used to explain many phenomena in our different interviews, as well as for some unique comments about editing the tape and in dissembling its segments into a program: "They would have to go to the school and film it and then come back. (OK, then what would they do?) They'd take it and check it and see if there's any mistakes on it and they'd take those mistakes out. After it's all finished and looked exactly right, they'd put it on . . . they'd use the same that they were putting on other stuff—they'd use that same tape to use that other stuff. (What would they have to do to put it on the TV?) There's this big machine somewhere, it's like a big VCR and they stick it in—they stick a whole bunch of movies of that show on the TV and so everybody gets the channels that they bought." [The student seemed to be saying that people at the television station edit and compile a program on tape and then feed the tape into a machine that causes it to be broadcast to the right homes on the right channels].

Second grade: They would take the tape to "a huge building with this little thing at the top [antenna] which sends it to any house because of the electricity;" they would take the tape out of the camera and put it "somewhere special" to broadcast; they would tape it using cameras that were "hooked on to all the Channel 6s in the world;" the school would tape the event and send the tape to the television station [another response that doesn't recognize that the station sends reporters out to get stories].

This response is quoted for its reference to a news director: "They'd have to run it through a few times around in their room and the guy who runs the thing says if its good or not.

He just says if it's good or bad and then he just directs stuff and makes signals with his hands about where the update man [news anchor] wants to go. (What would they have to do in order to show it?) They have to bring cameras—like TV cameras and a taping thing. Then they'd have to go back to the broadcasting thing [station] and show it on the news and stuff—broadcast it. (What does it mean to broadcast it?) Put it on the TV, and maybe on the radio."

Third grade: After it's recorded, they take it off the tape and put it in Channel 6 so it will show on Channel 6.

The following third grader is quoted for her primitive versions of taping and editing: "They'd have to go to the school and [pantomimes videotaping]. (So they'd use the camera.) And then a special machine will put it onto a piece of paper [tape?], and then you could make it move and stuff and show what he was doing. (So between coming out here and taking the film and then showing it on TV that night, do they do anything?) Yeah, they have to get it ready and put it through a machine and see if there was any air in it and then they have to check through it.

Question 26

Most responses were well captured by the coding categories. However, it should be noted that most responses coded in Category 5 were for students who mentioned satellites, dishes, or antennas but not waves, and most of the codes in Category 7 were for students who spoke of a "special" camera or video recorder that was somehow connected to all of the televisions in the world, or at least the nation.

Kindergarten: None.

First grade: None.

Second grade: There's a network that goes all over the United States and shows everyone the movies; tape it, then put the tape in a slot at the base of an antenna tower.

Third grade: Spoke of "signals hitting antennas" [one of just a few students who had this idea]; satellite dishes "bring in electricity."

The following third grader is quoted for the best overall response: "They make the show in a studio, and they practice like if they were making a movie. They practice until they get it right, and then they send it to us like in a show by satellites. Satellites bounce from one to another and then it comes to your TV. (What is it that's bouncing from these satellites?) I think it's the electric stuff. I'm not sure, but I think it's electric waves or something like that."

Discussion

The students were familiar with radio and television in their current forms, so they could talk about how radio brings us music, news, and weather and television brings us entertainment and news and weather reports and allows us to see the events being broadcast. Except for the latter comment, however, their responses showed little awareness of these inventions as fundamental. In particular, they showed very little awareness of the fact that these inventions made it possible to instantaneously broadcast events to millions of people around the nation or world, that the ubiquity of such instantaneous communication "shrunk" the world in many ways, and that these innovations in communication (along with innovations in transportation) eventually homogenized the world to a considerable degree. The purviews of students of these ages are mostly restricted to their personal life spaces and experiences, so they think of radio and television as media available for personal entertainment and information, not as communication media that have transformed the world into a rich network that facilitates instantaneous and continuing communication among people all over the world.

In responding to Questions 25 and 26, the students showed good knowledge about the people but not the electronics involved in bringing television shows to our homes. They understood that a local television station would send out personnel to videotape an event they wanted to cover on their news program, and many of them displayed at least some knowledge about how entertainment shows or cartoon shows are made. However, few of them understood much about what is involved in broadcasting a taped news event, and even fewer understood that broadcasting is accomplished by transmitting wave signals through the air to antennas or other receivers. Some made reference to receiving television programming via cable but did not consider how the programming gets to the local cable company. Others understood that the cameras recording an event being broadcast would have to be connected somehow to the television sets in viewers' homes but were vague about what this connection might be, and did not make reference to transmission of signals through the air. As with most of the things that we have asked about in all of our interviews, students showed a great deal of practical knowledge about how to use the things being asked about, but much less knowledge about the nature of those things, where they come from, and how they work.

The Economics of Television

The next two questions assessed students' understanding that most television programs are free to viewers because the networks and stations that make and show the programs get money from sponsors who pay them to show the advertisements that accompany the programs.

Question 27. We have to pay for pay TV channels, like HBO, but other channels are free. Why is that—why are some pay and some free? (If necessary, ask: **You know, another thing about television is that they keep interrupting their programs to show commercials. Why do they have all those commercials on television?** (If the student says that commercials provide a break so that performers can get ready for the next scene, point out that TV channels show commercials during movies that are already made, so they must have some other reason for showing commercials. If the student says that the sponsors want to show commercials because they want people to buy their products, accept this but probe further to ask why the television stations let these companies show their commercials.)

Question 28. Television programs often get cancelled—the networks take them off the air and put on something else instead. Why do they do that? (Probe to see if the student is aware of the importance of program popularity and connects this to ratings and then to income from sponsors. If the student initially talks about reasons why a show would go off the air only temporarily, such as during a tornado, clarify that you refer to permanently getting rid of a show. If necessary, use the student's favorite show as an example: **Well, you like to watch __________. Someday the people who run the channel that shows __________ might say, "We don't want to show __________ anymore—let's get rid of it." Why would they do that?**

When asked why we pay for some channels but not others (Question 27A), more than half (50) of the students were unable to respond. Of the rest, 20 said that we only pay for new programs or especially good programs, 11 said that we pay for movies, and 24 gave other responses not classifiable in these two categories.

When asked why television stations show commercials (Question 27B), 26 students could not respond. The other 70 students made one or more of the following statements: Commercials are shown to entice you to buy a company's products or services (36), the actors, news anchors, or other people involved in making the television program need time to rest, take a break, correct a problem, rehearse the next scene, etc. (34), commercials are shown to give viewers information (7), or the breaks are planned to allow viewers time to get up and make popcorn or do something else that they may need to do in between segments of the show (7). Although 36 students understood that commercials are intended to entice viewers to buy products or services, only 9 of them clearly understood that the companies advertising their products or services pay the TV stations to show their commercials.

When asked why television programs sometimes get cancelled, 29 students were unable to respond. The others suggested the following reasons: Viewers tire of the show or don't like it anymore (33), the television station finds out that people aren't watching the show and takes it off the air (22), the people who make the show are tired of doing it and want to quit (15), the people who make the show have begun to argue among themselves, make mistakes, etc. (8), the people who run the network don't like the show anymore (7), or the people who make the show have run out of new ideas for it (6). All of these are valid or at least defensible reasons and the majority of them emphasize a drop-off in viewership, although here again, only 9 students went on to say that if people don't watch the show, the network doesn't make money, and these students were thinking of pay channels on cable. The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

27. I don't know. (Do you know why the networks keep interrupting their programs to show us commercials?) No.

28. I don't know.

Kate

27. I don't know.

28. I don't know.

First Grade

Chris

27. I don't know. (Another thing about TV is that in between the programs they show us commercials. Why do they have commercials?) Because they got to get other paper to draw them and show them again. (So you think it gives Rug Rats people a rest?) Yeah. (OK, that might be one reason, but they show commercials at other times too, when nobody needs a rest—like when they're showing a movie that's made already.) Yeah, cause they're going to show other things to buy, like shampoo and stuff. (That's right. They show commercials because of the products. So why do they show those commercials?) So they'll buy it. (So that's why companies make the commercials and show the commercials. But why does the TV channel let them show those commercials?) I don't know. (Why don't they just have all Rug Rats and no commercials? Any idea?) No.

28. Because they have nothing else to show about what the Rug Rats are going to do. (OK, but maybe the Rug Rats people say, "We can make more shows. We want to make more shows." But the TV people say, "We don't care. We don't want it." Is there any reason why they would do that—take a show away like that?) They're getting tired of it. (Tell me more.) I don't know.

Lauren

27. I don't know. (Another thing about television is that they keep interrupting their programs to show commercials. Why do they have all those commercials on TV?) Because there might be a big thing and they might not know some parts and so they just walk out or something like that. (Could you tell me a little bit more about that?) The actor might have to go backstage and another one come and so you don't see how they do it—only the people who are watching at Nickelodeon studios. (Often they show commercials in the middle of movies that are already made, and it's not about changing scenes. So they must have another reason for showing commercials.) Because if you were making popcorn and you didn't see part of a movie, they couldn't really show it or

something. (Why does the television channel let people show commercials?) I don't know.

28. Cause they didn't want it anymore. (Why?) Because maybe it gets boring and the parents called and said "We don't want Pooh Bear anymore because our kids are getting tired of it.

Second Grade

Mark

27. Cause maybe like this wrestling one—it might be like this special one that's really good, cause maybe like this one is real good and you might want to watch it so you have to pay for it cause it's really good and you can't watch it on TV because it's so good, so you have to pay for it. (So sometimes they have this extra special stuff that they charge you for?) Yeah. (Well, maybe the thing to ask is how come the free channels are free?) Cause maybe they're not as good as the other ones. (The TV networks—when they show us these programs, they interrupt them every once in a while to show commercials. Why do they do that?) Cause maybe there's like this new stuff that they want people to buy and they interrupt it so they can tell you about it. (OK, that's why the company wants to show us the commercial, but why does the TV station let them show it?) People who want to advertise will come to the TV people and ask them to put their commercials on and the TV people will do that as a favor for them.

28. Cause maybe they had a vote and then they said, "Well, maybe I like this show better than Cosby, so they can watch the show they like," instead of putting what the other people liked. So they would have more people that like the other show instead of Cosby. (Are you talking about just the people at the station making this decision or do you mean people everywhere all over the country?) Everybody all over the country. (So you think the shows that they have on are the ones that more people want to watch?) Yes. (Why would they do that?) So they'd be happier so they could watch what they wanted to watch.

Emily

27. I don't know. (Another thing about television is that they keep interrupting their programs to show commercials. Why do they have all those commercials on television?) So we can take a break from their show if we want to.

28. I don't know.

Third Grade

Dale

27. Cause there are special shows on that aren't on that much. (Anything else you know about why some are pay and some are free?) No. (When we watch our shows, they interrupt the show every once in a while to show commercials. Why do they have commercials on TV?) To tell what's going on at stores and stuff. (OK, so that's why the stores want to show the commercials, cause they want people to buy what they're selling. But why do the people who run the TV channel—why do they allow the stores to show these commercials?) I don't know.

28. Cause they were breaking a new show they wanted to put on TV. (They might have a new show they want to put on. Why wouldn't they just stay with the old one?) I don't know.

Chelsea

27. Probably because sometimes you don't watch it. You just don't watch it all the time and you probably just don't like it and so you don't have to pay for it because you don't watch it. You have to pay for the channel that you use the most, like for news or . . . (Another thing about television is that they keep interrupting their programs to show commercials. Why do they have all those commercials on television?) Probably because sometimes they need a break, cause they can't go on or they made a mistake and they have to tell them, and they have to do it different if they show the show over—another copy of it. (Yeah, sometimes the TV channels show commercials during movies that are already made.) The Disney Channel, yeah. But some of the time it doesn't show channels, cause sometimes people just get up, but I don't know if they know that or not. They can see through the TV. Like they have a little alien sitting in the TV watching you. (They show commercials during movies that are already made, so there must be other reasons for showing commercials. I think you just said they do it for channel identification. Is that right? Are there other reasons?) Probably if they want to do commercials of what kind of food they've got. Sometimes they show what they've got in malls and what new stuff they just got in, or about Beanie Babies or food stores that they've got, like what's their new thing or theme. (Why would the TV channel let the malls show the commercials?) Probably because sometimes people don't want to only sit there for a long time watching the movie. They probably just want to see a commercial for a little bit. (Why?) Cause it might be really boring sitting there watching TV instead of just going outside and playing. That'd be a lot funner if you did that instead of just sitting there in front of the TV just staring and watching the commercials. Sometimes it can be interesting for kids.

28. Probably because they've got a new thing coming on and instead of watching the Nickelodeon thing, that just makes me mad because I don't like it when they change to a different thing. (Why do you think they do it, then, if you're getting mad? Why do they do that?) Because they need new shows that are better on it and they can't always just have old shows because they can't keep on showing one over and over because some

> people might get bored of it and say, "I know what's going to happen with this kid. I know what they did." They'd think it was pretty boring because they've seen it too many times. (So it's to stop people from getting bored. Why is that important to the people who have the channels?) I can't figure out that one either.

Grade Level Differences

Once again, the grade level data indicate that the younger students more often were unable to respond to these questions and the older students more often supplied the most sophisticated responses. Other responses were not significantly related to grade level, or in one case, showed a nonlinear relationship (4 of the 6 students who suggested that programs get cancelled because the people who make them have run out of new ideas were first graders). Older students were more likely than younger students to say that we pay for some channels because they show good or new programs, because they show movies, or for "other" reasons; to say that television stations show commercials because the people who make the shows need break times, the commercials give us information, the commercials entice us to buy products or services, or the companies pay to advertise on TV; and that television programs sometimes get cancelled because viewers don't like the shows anymore, the stations take them off the air when they see that people aren't watching them, or the network doesn't make money if people aren't watching in sufficient numbers. In general, the older students had more, and more accurate, knowledge about the economics of television than the younger students did.

Achievement Level and Gender Differences

This set of response categories yielded three significant relationships with achievement level and four with gender. More lower achievers were unable to answer the question about why we pay for some channels but not others. High achievers were more likely to answer that question by citing "other" reasons, as well as more likely to know that companies pay television stations to show their advertisements.

The four gender differences all favored the girls. More girls than boys gave "other" reasons why we pay for some channels but not others, said that TV stations show commercials to give the people making the program break times or to allow times for viewers to get up and do things, and said that television programs sometimes get cancelled because the network executives don't like the shows anymore. This pattern suggests that girls know more than boys about the economics of television, although the differences are not as large as they may seem at first because certain other categories showed near-significant differences favoring boys. Also, two of these four responses (those indicating that television stations show commercials to allow either the people making the program or the viewers watching it to get breaks) are defensible as statements about potential advantages to such breaks, but they are not the basic explanation for why television stations show commercials.

Relationships Among Response Categories

The only noteworthy intercorrelations involving this set of response categories were correlations between certain responses and the maturity set of responses to the interview as a whole. The maturity set included statements that companies show advertisements in an attempt to entice us to buy their products and services, that the companies pay to advertise, that programs get cancelled because viewers stop watching when they get tired of the show or don't like it anymore, and that a program gets cancelled because the station realizes that people aren't watching it much anymore so they replace it.

Rare and Unique Responses

Question 27A

The students had difficulty explaining why we pay for some television channels but not others, beyond expressing the general idea that we get better stuff by paying, such as new movies. Several responses originally coded in their own categories did not appear frequently enough to allow for statistical analysis, so they were included among the "other" responses: You pay for adult/grown-up/R-rated stuff (4), you pay for programs that come from far away (3), you pay only for the channels that you use the most (2), or you pay for programs that a lot of people want to watch (1).

Kindergarten: None.

First grade: Some channels take electricity and some don't; you pay for important stuff that you need, like weather warnings, and the free stuff is stuff that's not real, not true things that happened.

Second grade: The broadcasting company has to have pay because they just invented the new program; HBO has special shows like concerts; you have to pay for a Red Wing hockey game that's far away like in Dallas, but not for a closer one in Detroit; you pay for longer shows like movies; the people who make shows on the pay channels need money to get on a lot more channels like the free shows [to expand their operations]; the pay ones are expensive because of the electricity they use in your house.

Third grade: Cable is more expensive because it has more channels; free ones are free because they come with the television when you buy it; you pay if you live too far away for the "tower thing" to reach you; cable is more expensive because it has more channels; you pay for the shows that are more costly to make; you pay if you live too far away for the regular channels to reach you; you pay for the ones that are expensive to get over to our state; you pay when the people who make the show want money for it; news is cheap to produce but entertainment shows are costly, so you have to pay for them.

Question 27B

Many students recognized that commercials inform us about products. Of these, about 40% saw the commercials as purely informative (i.e., as a public service), but the rest understood that the commercials are intended to entice us to buy products or services.

Kindergarten: None.

First grade: Commercials teach you stuff so that you will be smart; the company shares the money it makes with the television station [student seemed to think that television stations get a percentage of the profits generated by ads, rather than a flat fee for each showing].

Second grade: The TV station lets advertisers take turns [i.e., regulates how often and when they get a turn to run their ads, but doesn't charge fees]; the television stations agree to show commercials if they are asked [i.e., they are nice people willing to do a favor]; "I don't know, it wasn't my decision."

The following second grader is quoted at length as an illustration of an otherwise complete response that nevertheless doesn't recognize that advertisers pay fees to the television stations: "They show commercials so people don't have to stay through the whole thing and so it seems like it's shorter. (Why wouldn't they want to show us the whole thing without commercials?) Because then it would be more money to show the whole thing, because if like someone's watching TV and there was commercials, then a person would have bathroom breaks, but if they wanted to have it through the whole show, they probably couldn't stay because the show is at dinner time and so they have to fix dinner. (OK, but what did you say about money?) Sometimes you have to pay for it in taxes for the channel because you watched it, and if there wasn't commercials, then you would have to pay for every single TV show you watch, plus it would be harder to keep track of which show you're watching. (Are you saying that because there are commercials, we don't have to pay as much?) Yes, because the people who are filming, sometimes they need to film something else, and if there wasn't commercials, someone would have to film two at a time and if there was only one person working if the other person was sick or something. (It sounds like you're saying that the commercials give them a chance to break up and do other things. However, they show commercials even when they're showing movies and no one is there that needs to take a break. So are there other reasons why they have commercials on TV?) Like to show people what new stuff is, like new movies and stuff like that, and which show is going to be next, so they don't watch shows that they don't want to watch. (So commercials tell you about things that you might want to do, like McDonald's commercials tell you about McDonald's. Why does McDonald's want us to see those commercials?) So people will come to McDonald's and buy stuff. (OK, that's why they want to show the commercial. Why does the TV channel allow McDonald's to show those commercials?) Because there's lots of McDonald's and some people don't really like McDonald's, and if it's a toy they're collecting and if it's at McDonald's or Burger King, they might want to go to McDonald's or Burger King to get one. (OK, but why would the TV people let McDonald's show commercials on their channel?) I don't know."

Third grade: The TV people agree to show commercials if they are asked; the most popular commercials are on the Super Bowl because lots of people watch; the company shares the money it makes with the TV stations; you pay for important stuff that you really need to see and the other stuff is free; the stations charge for commercials unless their performers need a break, and then they might run them free.

Question 28

Most of the responses were well described by the categories, although it should be noted that all of the "6" codes (if people don't watch the show, the network doesn't make any money) referred to network income from cable subscriptions, not from advertising. Also, it is worth noting that these interviews were done shortly after the widely publicized announcement by Jerry Seinfeld that he was quitting his show and shutting it down, and this appeared to have influenced most if not all of the students who said that the people who make the show might decide to quit doing it.

Kindergarten: It's a different time of year [and therefore time for some new shows]; the makers of the show are punished or fired because they didn't do nice things; maybe they couldn't keep making the show because their camera broke or they ran out of tape; maybe the show was scary to children and was removed for that reason.

First grade: Something was wrong [sickness, injury] with one of the people who worked on the show.

Second grade: The network has to make money "for the United States and for people who are sick and stuff;" maybe viewers held a vote to decide between the shows; the network replaced Reading Rainbow with another program because they wanted a program for younger children; the network executives are selfish and don't care what other people want.

Third grade: Maybe the show was too violent and kids were watching it; maybe the show was too rowdy or bad and should have been removed, like South Park.

Finally, one third grader believed that some special group (apparently some kind of censoring board) wouldn't let a program stay on the air if something was wrong with it (couldn't specify what might be wrong).

Discussion

More than half of the students could not respond when asked why we have to pay for some television channels but not others. Those who were able to respond suggested that the pay channels provide programming that is especially new (particularly movies), expensive to produce, in high demand, or of high quality. A few students also noted that people who live in rural areas or other areas that get poor reception (e.g., if you live too far away for "the tower thing" to reach you) must pay in order to get good reception. This question also produced some interesting misconceptions: You pay for adult entertainment, for programs that come from farther away, and for programs that require more electricity than others.

Even though more than a third of them understood that commercials are intended to entice viewers to buy products or services, few students had awareness of commercial television as a business (i.e., a mechanism for delivering viewers to watch commercials). About a fourth of the students had no idea why television stations show commercials, and most of the rest thought that they do so as a form of public service (i.e., to provide people with information that they want or need), as a favor to companies who ask them to do so, as a way to allow the people who make the shows to take breaks in order to get ready for upcoming scenes or correct problems, or as a way to provide viewers with breaks to allow them to get snacks or do things that need to be done while they are watching the program. Only nine students understood that companies pay television stations to run their advertisements, and two of these held a profit-sharing (rather than fee per showing) theory of the financial arrangements involved. Few if any of the students clearly understood that commercial television stations are profit-making enterprises that generate income from sponsors because they deliver viewers for their advertisements.

BEST COPY AVAILABLE

Because they did not understand commercial television stations as enterprises set up to generate profits, the students didn't understand the importance of ratings and "the bottom line" as influences on networks' and local stations' decisions to replace programs that are not attracting enough viewers (let alone the complicating factor of generating enough viewers with the demographic characteristics most desired by the sponsors). Only nine students indicated that the network would not make money if people didn't watch the show, and these students were all thinking of subscription cable services (perhaps even pay-per-view movies or other specials), not programs shown on free channels. Thus, no student said that if a program fails to attract enough viewers, sponsors will not pay for their ads to be shown during it, and the network/station will lose money. Nor did any student show understanding of the facts that stations must pay for the programming they show, that they recoup these costs (and make profits besides) from the monies collected from sponsors, or that how much they get depends on ratings information indicating how many people watch the show.

Consequently, instead of linking decisions about changes in programming to ratings and income, the students linked them to other causes. Some of these resided in the writers, actors, or others involved in making the show (they were tired of doing it, they had run out of new ideas, or they were no longer getting along and working together smoothly). Others resided in the views of network executives or local station managers (students did not identify these people in these terms or distinguish their roles, but instead referred just to the people "who run" or who "are in charge of" the networks/stations). Typically, the students depicted these executives as service-oriented people whose decisions reflected their desire to please their viewers (so they replace a show then they find that people are not watching it anymore or they have the opportunity to schedule a new show that they think their viewers will like). However, a few students depicted the executives as acting selfishly, scheduling the programs that they enjoyed, whether people in general liked them or not. Finally, a few students invoked the notion of censorship, suggesting that certain programs might (or should) be removed because their content was too raunchy or frightening to children.

In general, the students tended to exaggerate the role of writers and performers relative to the role of network/station executives and sponsors in determining what programming is made available to the public. To the extent that they did speak of network/station executives, they depicted them as service-oriented people managing a public trust (much like the people running public television networks/stations), not as people running businesses strongly influenced by bottom-line numbers.

Knowledge of Electronic Mail

The last question was asked to see if students were familiar with electronic mail, and if so, what they could say about how it works and why people use it.

Question 29. Have you heard of electronic mail, or e-mail? (If yes: **What is it? . . . How does e-mail work? . . . Why might someone want to use e-mail instead of regular mail?).** (Probe for two possible reasons: It's faster and it's less trouble because you don't need stamps, envelopes, etc.).

Almost half (43) of the students had not heard of electronic mail, and another 9 said that they had heard of it but could not elaborate with any specifics. The remaining students supplied one or more of the following responses: e-mail works on the computer (39), it is faster than regular mail (33), it doesn't require using an envelope, taking it to a mail box, and other steps involved in mailing things through the U.S. post office (15), and typing e-mail messages is easier or neater than writing letters by hand (12). In short, the students who were familiar with e-mail understood how it works and why people generally prefer it to surface mail.

The following examples from average-achieving boys and girls are representative of the responses from students across the four grade levels.

Kindergarten

Jered

29. No.

Kate

29. Nope.

First Grade

Chris

29. I heard of e-mail. (Tell me about e-mail.) It can come to you on the computer if you're on the computer. (That's right. My question is, why would somebody want to use e-mail instead of regular mail?) They can just print it on the computer and send it to people. (Why is that better than regular mail?) Cause you don't have to go outside and put it in your mail box, and you can just stay inside and print it out and send it to people. (OK, so it's easier to do. Is there any other reason why e-mail might be better than regular mail?) I don't know.

Lauren

29. I haven't heard of it.

Second Grade

Mark

29. Yeah, but I don't know what they do. (Do you have any idea what e-mail is?) No, but I've heard it a thousand times but I don't know what it means.

Emily

29. I don't know.

Third Grade

Dale

29. Yeah. (How does it work?) I don't know.

Chelsea

29. It's where you can type it on the computer and it'll send it. It'll say, "Do you want to send the message?" and you'll click yes or no, and you send it. That's what my aunt has. She works here and she sends an e-mail to my uncle at the junior high way over there. As soon as she does, it just shows up on his computer. It's pretty easy for her to use. All she has to do is type the message in and then send it. (Why might someone want to use e-mail instead of regular mail?) Probably because you don't have to write it and your hands won't get tired doing it, you don't have to lick the envelope shut. Sometimes they can tape it, but they like to lick it better because it'll look better. And you won't have to put a postage stamp on it either. You can just type it down where it's going and it'll just send it over there.

Grade Level Differences

This knowledge was strongly associated with grade level. Younger students were more likely to be unable to respond to the question, whereas older students were more likely to say that e-mail works on the computer, is faster, doesn't require envelopes or trips to the mail box, and is typed rather than written by hand.

Achievement Level and Gender Differences

This set of categories yielded four significant relationships with achievement level and one with gender. The achievement-level relationships indicated that lower achievers were more likely than higher achievers to be unable to respond to Question 29, whereas higher achievers were more likely to say that e-mail works on the computer, that it is faster than conventional mail, and that it does not require envelopes or trips to the mail box.

The significant relationship with gender occurred because 26 girls but only 17 boys were unable to respond to the question. In addition, there were near-significant tendencies for more boys than girls to say that e-mail works on the computer and is faster than conventional mail. Thus, more boys than girls knew about e-mail.

Relationships Among Response Categories

The only noteworthy intercorrelations involving this set of categories were correlations with the maturity set of responses to the interview as a whole. Responses to Question 29 that indicated that e-mail works on the computer and that it is faster than conventional mail were included among this maturity set of response categories.

Rare and Unique Responses

Most responses to this question were well represented by the coding categories. However, it is worth noting that several students had heard of e-mail but not electronic mail.

Kindergarten: None.

First grade: E-mail can go to far places, beyond the range of mail carriers.

Second grade: E-mail can go across the ocean but mail trucks cannot; thinks that e-mail is done by phone, when you call people on television after the show, using the number they provide [perhaps thinking of shopping networks].

Third grade: E-mail is cheaper [two other third graders also made this response]; e-mail is more fun; knows about e-mail but prefers regular mail and does not see a cost difference between the two because e-mail requires electricity.

Discussion

Fewer than half (44) of the students had heard of e-mail and could say something specific about it. However, most of what these students were able to say was accurate. Majorities of them said that e-mail works by computer and is delivered much more quickly than conventional mail, and significant minorities of them said that e-mail is typed rather than written by hand and that it does not require using an envelope, taking it to the mail box, or other steps involved in accomplishing conventional mail. Except for one student who thought that it costs as much to send a message via e-mail as via surface mail and one other who confused e-mail with calling phone numbers shown on television shows (apparently, to order merchandise shown on home shopping networks), what the students had to say about e-mail was free of misconceptions.

Most, if not all, of the students who knew about e-mail did so because they had observed it being sent and received on computers, and some had sent and received it themselves. Given the relative recency of the proliferation of e-mail among the general public (and the fact that these interviews were done in 1998), we were surprised that almost half of the students already had acquired basic understandings about e-mail's nature, uses, and advantages. This suggests that the same question addressed to a comparable sample of U.S. children in the year 2010 might elicit very high percentages of accurate responses.

General Discussion

The students' responses to the communication interview displayed many of the same patterns seen earlier in their responses to interviews on shelter, clothing, and food: They knew more about the physical appearances of things than their underlying natures, and more about the uses of products than about how they do what they do or what is involved in creating them. Sophistication of responses was related much more closely to age (grade level) and personal experiences out of school than to achievement level or gender. Knowledge about the past was limited and tinged with presentism (i.e., viewing people in the past as less intelligent or well functioning than we are because they lacked modern inventions).

Responses to the initial questions indicated that only about a fourth of the students could define communication adequately, but most of them could speak knowledgeably about it once told that communication involves talking or sending messages to other people. The students were generally aware that communication is a basic need, although this was not as clear and obvious to them as it was for food, clothing, and shelter. Even so, a heavy majority said that humans need to communicate, and most of these were able to give examples of when and why communication needs arise. Students recognized the need for communication most clearly with respect to emergencies or situations in which there was a need to communicate information in order to learn or carry out a job. However, some students also noted the need for communication to express feelings, and they tended to suggest that life would be worse without communication because we would be lonely and isolated from others.

Most students were able to identify one or more ways in which our lives would be worse if we couldn't talk, typically suggesting that it would be more difficult for us to get and share information; that we would have to use sign language, read lips, or communicate in writing; or that we would be isolated from others and unable to share our feelings. Some of the references to lip reading or writing reflected the fact that certain students answered the question in terms of the plight of individuals suffering from speech impediments rather than in terms of subtracting speech from the human condition. However, other students who made these responses were laboring under the misconceptions that lip reading and writing would have developed in humans even if they did not possess the ability to speak.

About fourth-fifths of the students understood the basic idea that talking is better than barking because speech allows for more subtle and differentiated communication than barking does. However, some students overestimated what occurs in the minds of dogs, assuming that their thoughts and attempts to communicate are verbally mediated. The general levels of understanding demonstrated here appeared to progress from believing that dogs think and communicate just like humans except that they use a different "language," to not crediting dogs with verbally mediated thought but recognizing that they can communicate different "messages" through different forms of barking, to recognizing that although barking has some communication value, it is much more limited than language. Only two students specifically noted that human speech mechanisms allow us to produce a much greater variety of sounds and sound combinations in our speech than dogs can produce in their barking.

The next set of questions asked about communication among preliterate people. Almost two-thirds of the students said that cave people communicated through speech, although almost as many said that there was a time when people did not have language. Among those who depicted cave people communicating through spoken language, only 13 clearly indicated that this language would have been much different from the one we use today. More than a third of the students suggested that cave people communicated through sign language or pantomime, a fifth mentioned writing or drawing (typically envisioning artwork on cave walls or primitive maps or directions scratched on the ground), and a sixth said that cave people grunted, growled, or made other vocal noises but did not communicate through speech. In our previous interviews, the students' responses to questions about cave people often drew from what they had seen on Alley Oop or Flintstones cartoons. Perhaps their exposure to these cartoons led many of the students to say that cave people spoke to one another pretty much as we do today.

Most of the students understood that Native Americans communicated through speech, although only a minority of them showed understanding of the fact that they spoke in their own languages (not English). Also, only minorities of the students understood that Native American languages were spoken but not written, so these people did not possess books or communicate across distances by sending written notes. Many students, including many of those who understood that Indians did not have books or libraries, thought that Indians did or could have engaged in reading or writing. Some thought that they did not because their interests lay elsewhere. Others understood that they could not, but thought that this was because they lacked writing materials or the knowledge and wherewithal to make books or build libraries (i.e., rather than because they lacked the alphabetic principle). A few of the students thought that whatever writing Native Americans did on walls or the ground (or on bark, etc.) involved language, and a few of those who said that they communicated in sign language seemed to think that they used the same sign language used today (e.g., American sign language).

The next questions addressed students' appreciation of writing as a fundamental, world-changing invention. About half of them were able to explain why this invention was so basic, such as by noting that writing made it possible for people to communicate across distances, facilitated their learning, and made it easier for those who could not speak or hear to communicate with others. The students were less successful in applying this understanding to contrasting the distance communication options available to George Washington with those available to a preliterate Native American tribal chief, primarily because they often were unclear about when Washington lived and which inventions were available at the time. Consequently, some students thought that Washington and Franklin could communicate only through face-to-face interactions, but others thought that they could use communication or transportation devices that were not invented until much later. Fewer than half understood that Washington could send Franklin a written message, and only about a third understood that Washington's message delivery options would not include anything like today's U.S. postal service.

The students typically depicted the earliest books as written in longhand on primitive forms of paper, perhaps using feather pens or ink made from berry juices. With the exceptions of a few who thought that the typewriter had been invented before the printing press, the students who were able to answer Question 10 understood that until the printing press was invented, making books was a laborious process that required printing or writing the text in longhand (and perhaps illustrating it by hand as well). Most of them spoke of the printing press as bringing benefits to those who manufactured books (less work required, less tiring on the hands) or improving the appearance of the text (easier to read because it was printed in typeface instead of written in cursive, less likely to get smudged, and more likely to have color or illustrations). Thus, most students emphasized a micro-level purview focused on the individuals involved in manufacturing or reading particular books, rather than a macro-level purview that included recognition of the printing press as a fundamental invention that triggered significant changes in the human condition around the world. Only 16 students noted that the printing press made it possible for people to make multiple copies of text with greater speed or ease and/or for more people to read more books.

The students were more successful in answering a subsequent question about how the invention of the telephone changed the world. A majority said that the telephone made it possible for people to converse without being face to face or to communicate across distances without having to write letters. Apparently, it was much easier for the students to envision the nature and implications of communication in a world without the telephone than in a world without the printing press.

The next question assessed students' ideas about how babies learn to talk and how they communicate their ideas when they lack specific vocabulary. The students generally understood that language is acquired both through specific instruction and through general exposure to communication from and among significant others in one's environment. They also understood that a young child who lacked relevant vocabulary would probably try to communicate needs by getting adult attention and pointing, gesturing, or attempting to say the word.

The students were less knowledgeable about indirect influences on vocabulary development. About half of them were unable to give a satisfactory response to the question about why the Eskimos' language has more words for snow than ours does. The other half were able to say that this was because the Eskimos live in a snowy environment, although for many of them, this was a brief guess that they could not elaborate. Few students noted that the Eskimoes needed to pay careful attention to snow and perhaps differentiate various subtypes for survival reasons, and none made a general statement to the effect that people need to pay close attention to their environment in order to thrive in it.

The next questions asked about communication among people who do not share a common language or who are handicapped by sensory deficits. The students found it difficult to visualize and talk about communication among people who do not share a common language, and some of them resisted the premise of the question by suggesting that the people might have some words in common, that they could communicate through writing, or that they could verbally explain to the other people that they did not understand their language. Only 37 students understood that communication under these circumstances initially would depend primarily if not solely on gesture or sign language (although with time, the people might teach each other their languages). Rephrasing the question to focus on examples (Columbus and the Indians or the student on vacation in France or China) made it easier for the students to respond, but most of their responses still involved attempts to undermine the premise of the question (they could use an interpreter), unrealistic suggestions (they could exchange written messages), or solutions that would take a great deal of time and thus not accomplish immediate communication goals (teach each other their languages).

The students varied considerably in their knowledge about the communication abilities of deaf and blind people. The younger ones tended to exaggerate the scope of these deficits, such as by thinking that deaf or blind people cannot communicate at all or that blind people also are unable to speak or to hear. Older students usually understood that deaf people may be able to read lips and that they can express themselves through speech, sign language, or writing, as well as that blind people can carry on conversations and read Braille materials. A few students displayed somewhat detailed knowledge, usually based on personal experiences with deaf or blind people. For example, 10 understood that although deaf people can talk, their speech is usually not as clearly articulated as other people's speech, and another 10 understood that people who become deaf after childhood are more likely to learn to speak well than people who were born deaf.

At least among students who understood that deaf and blind people can communicate, the responses concerning these people tended to be accompanied by expressions of empathy and recognition that these are otherwise normal people who have sensory deficits. There was no disparagement of these people or suggestion that they are generally weird, scary, or mentally defective.

Most of the students understood that languages expand as new words are coined, although fewer than half of them could suggest examples of words that entered our language within the last 50 years, and only 18 of these generated examples that were all accurate (applying a generous definition of accuracy). Most of the suggestions were technical or popular culture examples that in fact were introduced relatively recently or else incorrect examples that nevertheless were associated with good reasoning processes (scientific terms suggested on the grounds that most things scientific were discovered recently, "robe" because it is used following a shower and showers are relatively recent, etc.).

When shown drawings of "railroad crossing ahead" and "no bicycling" signs, almost all of the students understood the meanings of these signs. However, more than a third of them were unable to suggest a reason why these signs employ symbols rather than words to convey their meanings, and many of the others gave responses that focused on the whims of the sign maker (e.g., not wanting to take time to write out the words). Only 35 students clearly understood that symbols are used on these signs because they are quicker and easier to read than verbal messages (and universally interpretable regardless of the person's literacy level or native language).

When asked about the steps carried out by post office personnel in delivering a birthday card sent from Lansing to Chicago, most students were able to provide at least some details but only 38 generated responses that we considered to be both complete and accurate. Most students began by talking about obtaining the card, signing it, placing it into an envelope, addressing the envelope, and putting it in the mail box, then went on to say that the card would be taken to their local post office, transported to Chicago, and then processed at a Chicago post office where it would be assigned to a delivery route. Minorities of students added other details. Some of these were accurate, such as that the sender would place a stamp on the envelope, the local post office would cancel the stamp and sort the outgoing mail, and the card would be placed with other mail headed for Chicago. However, 19 students thought that the same mail carrier who picked up the card at the sender's house would travel to Chicago and deliver it personally. Also, another 17 suggested that upon arrival at Chicago, the card would be taken directly to the addressee's house without being first taken to a post office for processing. In addition, several students expressed misconceptions concerning how the post office would arrange to convey the card from Lansing to Chicago.

Responses to this question once again illustrated the micro-level purview of most of the students. Their answers tended to be guided by images of postal services being rendered by just one or a very small number of individuals who handle all aspects of the work personally, not images of the post office as a huge organization that employs hundreds of thousands of people who each work on just a subset of the steps involved in picking up, processing, and delivering mail.

The students' responses to questions about newspapers were interesting because they reflected the shifts that have taken place in recent years in the roles and relative prominence of newspapers vis-à-vis other communication media. The students' ideas about newspapers were generally valid as far as they went, but most were vague about how stories are composed, edited,

BEST COPY AVAILABLE

collated, and transformed into printed newspapers. Few students understood that newspapers fulfill unique functions by covering a much greater range of information than is covered on the television news and going into greater depth on the material covered in common. In fact, some thought that newspapers get all or at least most of their content from television and that they function as primary news sources only for people who do not watch the news on television (as well as backup sources for people who miss their usual news programs on particular days).

Most students were unaware of the newsgathering functions of newspapers. Only 15 referred to newsgathering and only a few of these clearly understood that reporters proactively develop stories rather than just receive what people convey to them. The students viewed newspapers mostly as supplements to televised news, read not so much for hard news content as for sports, features, weather, and local advertising and announcements. This view is probably more accurate than not for most current newspapers.

Despite being fuzzy or confused about the processes and technology involved in creating newspapers, the students had generally accurate ideas about what is found in them and why people read them. They viewed newspapers primarily as sources of entertainment and information about local sports, weather, and shopping or leisure time options, along with coverage of events not significant enough to be covered on television. None mentioned editorials, and only a few suggested that newspapers provide deeper coverage than that found on television. Those who mentioned reading the newspaper themselves tended to provide more sophisticated responses to the interview as a whole, even though many of these students said that their newspaper reading was confined to the comics.

Questions about broadcast media indicated that the students were very familiar with radio and television in their current forms, so they could talk about how radio brings us music, news, and weather and television brings us entertainment, news and weather reports, and allows us to watch the events being broadcast. However, their responses showed little awareness of the fact that the broadcasting and instantaneous communication features of these media have "shrunk" and homogenized the world in many respects.

The students did not show much knowledge of how radio changed society when it was first introduced and popularized. In particular, only a few of them were aware that prior to television, radio served the same kinds of nightly entertainment functions for people that prime time television serves today. Most of the students expressed awareness that television was an improvement over radio because it allowed people to see in addition to hear what was being broadcast. Otherwise, however, their explanations about what television brought to people focused on its delivery of cartoons and other entertainment rather than its delivery of news and information.

Questions about the creation and broadcasting of television programs showed that the students possessed good knowledge about the people but not the electronics involved in bringing television shows into our homes. They understood that a local station would send out personnel to videotape an event that it wanted to cover for its news program, and many of them displayed at least some knowledge of how entertainment shows or cartoon shows are made. However, few of them understood much about what is involved in broadcasting a taped news event, and even fewer understood that broadcasting is accomplished by transmitting wave signals through the air to antennas or other receivers. Some made reference to receiving television programs via cable but did not consider how the programming gets to the local cable company. Others understood that the cameras recording an event would have to be connected somehow to the television sets in viewers' homes, but were vague about what this connection might be. Only nine students made reference to transmission of signals through the air, and only a minority of these had clear ideas about the nature of these signals.

The students did not know much about the economics of television. The minority who were able to respond when asked why we have to pay for some television channels but not others mostly suggested that the pay channels provide programming that is especially new (particularly movies), expensive to produce, in high demand, or of high quality. A few also noted that people who live in areas that get poor reception must pay for cable services if they want good reception. A few thought that we pay for adult entertainment, for programs that come from farther away, or for programs that require more electricity than others.

Few students had awareness of commercial television as a business (i.e., a mechanism for delivering viewers to watch commercials). About a fourth had no idea why television stations show commercials, and most of the rest thought that they do so as a form of public service, as a favor to companies, or as a way to provide the people who make the show or the viewers who watch it with breaks in between segments. Only nine students understood that companies pay television stations to run their advertisements, and few if any clearly understood that commercial television stations are profit-making enterprises that generate income from sponsors because they deliver viewers for their advertisements.

The students also did not understand the importance of ratings and "the bottom line" as influences on networks' and local stations' decisions about programming. Only nine students indicated that a network or station would not make money if enough people didn't watch a show, and all of these students were thinking of people who pay for cable services rather than people watching programs on free channels. No student said that if a program failed to attract enough viewers, the network/station showing it would lose money because it could not sell enough advertising time or charge enough for broadcasting the ads. Nor did any student show understanding that stations must pay for the programs they show, that they recoup these costs (and make profits) from the fees they charge for broadcasting advertisements along with the shows, or that how much they get for these ads depends on how many people watch the show.

Consequently, instead of linking decisions about changes in programming to ratings and income, the students linked them to other causes. These included the ideas that the people involved in making the show were tired of doing it, had run out of ideas, or were no longer able to work well together; the network executives or local station managers want to serve their viewers by taking off programs that they do not watch anymore or scheduling new ones that they think the viewers will like; or programs are eliminated because their content is too raunchy or frightening to children. In general, the students depicted network and local station executives as service-oriented people managing a public trust, not as people running businesses strongly influenced by bottom-line numbers.

The last question dealt with electronic mail. Fewer than half of the students had heard of e-mail and could say something specific about it, but most of what these students were able to say was accurate. Majorities of them said that e-mail works by computer and is delivered much more quickly than conventional mail, and minorities said that e-mail is typed rather than handwritten or that it is easier to use because it doesn't require stamps, envelopes, or trips to the mail box.

Grade Level Differences

Significant relationships with grade level were observed for 164 of the 242 coding categories shown in Table 1. Of the 164 significant relationships, 152 were for linear trends and the other 12 were for nonlinear relationships. The 152 linear trends can be summarized simply by stating that the younger students were more likely to be unable to respond or to be coded in categories reflecting low-level responses, whereas the older students were more likely to be coded in categories reflecting sophisticated responses. In a few cases, one of the responses in a category set that was expressed more often by older students fell short of an ideal response to the question (e.g., television stations show commercials because the people who make their programs need breaks to rehearse upcoming scenes or take a rest), but this response was still preferable to the response categories coded more frequently for younger students (e.g., failure to respond to the question at all). Overall, then, the data show consistent tendencies for increases in knowledge across the K-3 grade level range.

Achievement Level and Gender Differences

Less than a fourth (52) of the 242 categories showed significant relationships with achievement level. Of these, 44 were linear trends and 8 were nonlinear relationships. Most of the 44 linear trends could be summarized simply by stating that lower achievers were more likely to be unable to respond or to give low-level responses to the questions, whereas higher achievers were more likely to give sophisticated responses. However, there were two exceptions to this pattern. First, in responding to Question 5B, five of the six students who suggested that the Native American chief wanting to get a message to a village five miles away might try to do so by yelling loudly were high achievers. This would seem to be a low-level response to the question, although one could argue that it is preferable to no response at all. Second, when asked whether deaf people can talk (Question 16C), 10 students not only said yes but elaborated to indicate that their speech is not as clearly articulated as that of other people. This knowledgeable elaboration was communicated by six low achievers but only two average achievers and two high achievers. This response appeared to derive from personal experiences with deaf people rather than from knowledge acquired in school, however, so the group frequencies are not as surprising as they might have been if the responses had been related more directly to the school's curriculum. In general, the higher achievers tended to provide more sophisticated responses than the lower achievers, although these differences were much smaller and much less often statistically significant than the grade level differences.

Once again, significant relationships appeared least frequently with gender. In this case, only 42 of the 242 categories in Table 1 showed significant gender differences. Of these, about 60% favored the girls (in the sense that they were more able to respond to the question, made fewer lower-level responses, or made more higher-level responses). The girls tended to know more about communication in the cave days, about how young children learn to talk and what they are likely to do to try to indicate their needs when they lack relevant vocabulary, about the communication abilities of deaf and blind people, and about how newspapers are made. Boys tended to know more about what is to be found in newspapers, about how television shows are made and broadcast, and about electronic mail. Some of these differences in patterns of knowledge might have been predicted from what is known about gender role socialization and gender differences in interests and activities.

Limitations of the Study

Our interviewers generally established good rapport with students and our questions were tailored for the age levels involved, so we believe that our findings comprise a generally valid representation of the nature and development of K-3 students' knowledge and thinking about communication as a cultural universal. Some of the students might have been more responsive if they had been interviewed on another day. All of them might have been able to say more if we had included more illustrations to provide visual stimuli. However, illustrations usually were not needed because we were asking the children about issues with which they had had personal experience, so verbal questions alone usually were sufficient to enable them to understand what we were asking. Also, we have found that illustrations tend to "stimulus bind" children's responses, and we prefer them to respond using their own images of the objects, events, or processes we ask them about, not images that we might supply by showing them a photo or other illustration.

The sample was large enough to allow population differences by grade level, achievement level, or gender to be detected via statistically significant Chi-squares in our analyses. However, it was limited in at least three respects. First, it was limited to the lower middle portion of the socioeconomic status (SES) range. No subsamples representing the upper or lower SES levels were included.

Second, even though the sample was open to students of any race or ethnicity (as long as all or at least most of their lives had been lived in the U.S.), the population of the community involved was such that the students we interviewed were overwhelmingly European American in their ethnic composition. Few students from African-American, Asian-American, Latino, or Native American families were included. We believe that children's ideas about communication are more likely to be influenced by their common experiences growing up within the contemporary U.S. society and culture than by differences in their family backgrounds, so we do not believe that this sample limitation is as serious as it might have been if we were asking questions about race or ethnicity. This is an untested assumption, however, and it remains to be seen whether our findings will generalize to racial and ethnic minorities.

The third limitation in the sample was geographic. The students all lived in Michigan. It is possible that somewhat different patterns of response to at least some of our questions might have been elicited from students living elsewhere.

Another limitation of the study is its lack of systematic data on the origins of students' ideas. Interviewers were instructed to ask students about where they got their information when they gave unusually sophisticated or detailed responses, but we did not routinely ask about the sources of the students' information. This was because we view the work as initial, establishing-the-parameters research in an emerging field, rather than as more specifically targeted research in a more mature field. We are trying to establish initial norms or parameters concerning five-to-eight-year-old American children's knowledge and thinking about cultural universals, not to trace the origins of the knowledge, to establish the mechanisms through which development occurs, or to address other issues that might become more relevant farther down the road. This "outline the big picture first, then start filling in the details" approach is the way that science normally proceeds in emerging fields.

We assume that particular subsets of knowledge and thinking are developed through a mixture of mechanisms that will vary with the topic. For example, a lot of spontaneous knowledge development probably occurs in learning about aspects of cultural universals that are observable in the home and neighborhood. In contrast, most of what is learned about aspects that existed in the past or currently exist only in other areas or cultures would have to be learned primarily through transmission of knowledge (initially from family members and the media, later at school). Eventually we will learn more about the mechanisms through which knowledge is acquired, what experiences lead to growth or change outside of school, how easy or difficult it may be to teach particular networks of knowledge in school, and what materials and methods may be helpful in doing so.

Implications for Primary-Grade Social Studies

In the introduction to this report we noted that Ravitch and others have claimed that primary-grade students do not need to be taught about cultural universals because they already know this information, having picked it up through everyday life experiences. This may be true for the very limited and trite information contained in many primary-grade social studies textbooks. We have no doubt that most children do develop intuitive understandings of these ideas through informal life experiences, and further that those who have not developed the ideas on their own are likely to understand them readily when they are pointed out by a teacher.

However, the findings of this study indicate clearly that children do not routinely acquire all, or even a significant portion, of what is worth knowing about cultural universals through everyday experiences (primarily because these experiences are informal and do not include sustained discourse structured around key ideas). Furthermore, the mostly tacit knowledge that they do accumulate is limited, disconnected, and frequently distorted by naïve ideas or outright misconceptions. We conclude from this that primary-grade students do stand to benefit from instruction about cultural universals, although the kind of instruction that we envision is much more coherent and powerful than the kind that students are likely to receive from teachers who confine themselves to the content in the major publishers' elementary social studies textbook series and the questions and activities suggested in the accompanying teachers' manuals.

We believe that such instruction belongs in the primary-grades social studies curriculum, although in addition to (not instead of) efforts to develop students' prosocial values and dispositions and a variety of skills ranging from map reading to critical thinking and decision making. The questions asked in this study reflect our notions about key ideas that might be emphasized in teaching about communication. Some of them might be classified more readily as science than social studies, but they all tap networks of knowledge that we believe to be basic for developing initial understandings of the topic. Like others who have focused on the primary grades, we believe that the curriculum in these grades should feature pre- or pandisciplinary treatments of topics designed to develop "knowledge of limited validity" (Levstik, 1986) or "protodisciplinary knowledge" (Gardner & Boix-Mansilla, 1994) about the topic, rather than attempts to teach children disciplinary knowledge organized as such.

We favor an appropriate balance between the three traditional sources of curricula (knowledge of enduring value, including but not limited to disciplinary knowledge; the students' needs, interests, and current zones of proximal development; and the needs of society in terms of the knowledge, skills, values, and dispositions that our society would like to see developed in future generations of its citizens). Within this context, we argue that a pandisciplinary introduction to the social world (past and present, taught with emphasis on developing understanding, appreciation, and life application of big ideas) makes more sense for primary-grade students than what we view as premature attempts to socialize these students into the academic disciplines.

In conclusion, we believe that primary-grade students stand to benefit considerably from treatments of cultural universals that are more powerful than those typically offered by textbook series. We define powerful treatments as treatments that enable students to develop understanding of how the cultural universal addressed in the unit works in our society, how and why it got to be that way over time, how it varies across locations and cultures, and what all of this might mean for personal, social, and civic decision making.

Such units would still focus on elementary and familiar content in that they would address fundamental aspects of the human condition and connect with experience-based tacit knowledge that students already possess. However, they would not merely reaffirm what students already know. Instead, they would raise students' consciousness of and help them to construct articulated knowledge about basic aspects of the cultural universal about which they have only vague and tacit knowledge (this refers to aspects that are concrete and comprehensible to them given their limited cognitive structures and prior knowledge; aspects that were too abstract or macroanalytic would not be included). Such units also would introduce students to a great deal of new information, develop connections to help them transform scattered understandings into a network of integrated knowledge, and stimulate them to apply the knowledge to their lives outside of school and to think critically and engage in value-based decision making about the topic. For more information about such units, see Brophy and Alleman (1996), and for detailed unit plans, see Alleman and Brophy (2001, in press a, in press b). The Alleman and Brophy (in press b) volume includes plans for an instructional unit on communication.

References

Abdullah, M. (2000). *Media literacy.* (ERIC Digest D 152). Bloomington, IN: ERIC Clearinghouse on Reading, English, and Communication, Indiana University.

Alleman, J., & Brophy, J. (2001). *Social studies excursions: K-3. Book One: Powerful units on food, clothing, and shelter.* Portsmouth, NH: Heinemann.

Alleman, J., & Brophy, J. (in press a). *Social studies excursions: K-3. Book Three: Powerful units on communication, family living, and transportation.* Portsmouth, NH: Heinemann.

Alleman, J., & Brophy, J. (in press b). *Social studies excursions: K-3. Book Two: Powerful units on government, money, and childhood.* Portsmouth, NH: Heinemann.

Barton, K., & Levstik, L. (1996). "Back when God was around and everything": Elementary children's understanding of historical time. *American Educational Research Journal, 33*, 419-454.

Banks, J. (1990). *Teaching strategies for social studies: Inquiry, valuing, and decision making* (4th Ed.). New York: Longman.

Berti, A., & Bombi, A. (1988). *The child's construction of economics.* Cambridge: Cambridge University Press.

Berti, A., & Monaci, M. (1998). Third graders' acquisition of knowledge of banking: Restructuring or accretion? *British Journal of Educational Psychology, 68*, 357-371.

Bogdan, R., & Biklen, S. (1982). *Qualitative research for education: An introduction to theory and methods.* Boston: Allyn & Bacon.

Brophy, J. (1999). Elementary students learn about Native Americans: Developing knowledge and empathy. *Social Education, 63*, 40-45.

Brophy, J., & Alleman, J. (1996). *Powerful social studies for elementary students.* Fort Worth: Harcourt Brace.

Brophy, J., & Alleman, J. (1997). Second graders' knowledge and thinking about shelter as a cultural universal. *Journal of Social Studies Research, 21*, 3-15.

Brophy, J., & Alleman, J. (1999a). *Primary-grade students' knowledge and thinking about clothing as a cultural universal.* ERIC Document Reproduction Service No. ED 439 072.

Brophy, J., & Alleman, J. (1999b). *Primary-grade students' knowledge and thinking about shelter as a cultural universal.* ERIC Document Reproduction Service No. 437 311.

Brophy, J., & VanSledright, B. (1997). *Teaching and learning history in elementary schools.* New York: Teachers College Press.

Brown, D. (1991). *Human universals.* Philadelphia: Temple University Press.

Buckingham, D. (2000). *After the death of childhood: Growing up in the age of electronic media.* Malden, MA: Blackwell.

Byrnes, J. (1996). *Cognitive development and learning in instructional contexts.* Boston: Allyn & Bacon.

Chandler, D. (1997). Children's understanding of what is "real" on television: A review of the literature. *Journal of Educational Media, 23,* 65-80.

Connell, R. (1971). *The child's construction of politics.* Carlton: Melbourne University Press.

Davies, M. (1997). *Fake, fact, and fantasy: Children's interpretations of television reality.* Mahwah, NJ: Erlbaum.

Del-Val, P. et al. (1981). *Understanding handicaps: A curriculum for changing students' attitudes toward the disabled.* ERIC Document Reproduction Service No. ED 232 367.

Egan, K. (1988). *Primary understanding: Education in early childhood.* New York: Routledge.

Feuerstein, M. (1999). Media literacy in support of critical thinking. *Journal of Education Media, 24*, 43-55.

Furnham, A., & Stacey, B. (1991). *Young people's understanding of society.* New York: Routledge.

Furth, H. (1980). *The world of grown-ups.* New York: Elsevier.

Gardner, H., & Boix-Mansilla, V. (1994). Teaching for understanding—within and across the disciplines. *Educational Leadership, 51*(5), 14-18.

Glaser, B., & Strauss, A. (1979). *The discovery of grounded theory: Strategies for qualitative research.* Hawthorne, NY: Aldine.

Greenstein, F. (1969). *Children and politics* (Revised Ed.). New Haven: Yale University Press.

Guzzetta, C. (1969). Children's knowledge of historically important Americans. In W. Herman (Ed.), *Current research in elementary school social studies* (pp. 392-400).. New York: Macmillan.

Henriksen, L. (1996). Naïve theories of buying and selling: Implications for teaching critical viewing skills. *Journal of Applied Communication Research, 24,* 93-109.

Hess, R., & Torney, J. (1967). *The development of political attitudes in children.* Chicago: Aldine.

Hirschfeld, L., & Gelman, S. (1997). What young children think about the relationship between language variation and social difference. *Cognitive Development, 12,* 213-238.

Jahoda, G. (1984). The development of thinking about socio-economic systems. In H. Tajfelt (Ed.), *The social dimension: European developments in social psychology* (Vol. 1, pp. 69-88). Cambridge: Cambridge University Press.

Lambert, T. (1994). *Deaf awareness: A program to increase student awareness of what it is like to have a hearing impairment.* ERIC Document Reproduction Service No. ED 384 160.

Larkins, A., Hawkins, M., & Gilmore, A. (1987). Trivial and noninformative content of elementary social studies: A review of primary texts in four series. *Theory and Research in Social Education, 15*, 299-311.

Levstik, L. (1986). The relationship between historical response and narrative in the classroom. *Theory and Research in Social Education, 14*, 1-15.

McKeown, M., & Beck, I. (1994). Making sense of accounts of history: Why young students don't and how they might. In G. Leinhardt, I. Beck, & C. Stainton (Eds.), *Teaching and learning in history* (pp. 1-26). Hillsdale, NJ: Erlbaum.

Moore, S., Lare, J., & Wagner, K. (1985). *The child's political world: A longitudinal perspective.* New York: Praeger.

Patton, M. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

Ravitch, D. (1987). Tot sociology or what happened to history in the grade schools. American Scholar, 56, 343-353.

Ravitch, D., & Finn, C. (1987). *What do our 17-year-olds know? A report of the first national assessment of history and literature.* New York: Harper & Row.

Schug, M. (1991). The development of students' economic thought: Implications for instruction. In W. Walstad & J. Soper (Eds.), *Effective economic education in the schools* (pp. 137-152). Washington, DC: National Education Association.

Stevens, O. (1982). *Children talking politics: Political learning in childhood.* Oxford: Martin Robertson.

Thoman, E. (1999). Skills and strategies for media education. *Educational Leadership, 56*(5), 50-54.

Unnikrishnan, N. & Bajpai, S. (1996). *The impact of television advertising on children.* Thousand Oaks, CA: Sage.

U.S. Office of Education, National Center for Education Statistics. (1995a). *NAEP 1994 Geography: A first look.* Washington, DC: Author.

U.S. Office of Education, National Center for Education Statistics. (1995b). *NAEP 1994 History: A first look.* Washington, DC: Author.

Van Evra, J. (1990). *Television and child development.* Hillsdale, NJ: Erlbaum.

Wolf, M. (1987). How children negotiate television. In T. Lindlof (Ed.), *Natural audiences: Qualitative research of media uses and effects* (pp. 58-94). Norwood, NJ: Ablex.

Wood, B. (Ed.). (1997). *Development of functional communication competencies: Pre-K-Grade 6.* Urbana, IL: ERIC Clearinghouse on Reading and Communication Skills.

APPENDIX A.

COMMUNICATION INTERVIEW

COMMUNICATION INTERVIEW

1. TODAY WE'RE GOING TO TALK ABOUT COMMUNICATION. THAT'S A BIG WORD--DO YOU KNOW WHAT IT MEANS? [If not, tell the child that communication means talking to people or sending them messages.]

2. ALL OVER THE WORLD, PEOPLE COMMUNICATE BY SENDING MESSAGES OR TALKING. DO THEY DO THAT JUST BECAUSE THEY LIKE TO, OR DO THEY NEED TO? . . . WHEN WOULD BE A TIME THAT PEOPLE NEEDED TO TALK? . . . HOW WOULD OUR LIVES BE DIFFERENT IF WE COULDN'T TALK TO ONE ANOTHER? (If necessary: WOULD OUR LIVES BE BETTER OR WORSE? . . . WHY?)

3. SOME ANIMALS COMMUNICATE BY MAKING NOISES, LIKE DOGS BARK AT EACH OTHER. BUT WE DON'T HAVE TO BARK--WE CAN TALK. WHAT DOES TALKING ALLOW US TO DO THAT DOGS CAN'T DO? . . . IS TALKING BETTER THAN BARKING? . . . WHY?

4. BACK IN TIME, THE EARLIEST PEOPLE LIVED IN CAVES. HOW DID THOSE PEOPLE COMMUNICATE? . . . DID THEY HAVE ANY OTHER WAYS TO COMMUNICATE? (If talking is not mentioned, ask: COULD CAVE PEOPLE TALK TO EACH OTHER?)

4a. (To be asked if the student's response to Question 4 implied that cave dwellers used spoken language): WAS THERE EVER A TIME WHEN PEOPLE DIDN'T HAVE LANGUAGE--WHEN THEY DIDN'T KNOW HOW TO TALK TO EACH OTHER? . . . HOW DID THOSE PEOPLE COMMUNICATE?

5. BEFORE COLUMBUS DISCOVERED AMERICA, THE ONLY PEOPLE LIVING HERE WERE THE INDIANS. HOW DID THE INDIANS COMMUNICATE? . . . IF THE CHIEF OF ONE VILLAGE WANTED TO GET A MESSAGE TO THE CHIEF OF A VILLAGE FIVE MILES AWAY, HOW WOULD HE DO IT? [The intention of these questions is to see if students understand that Indians had oral but not written language. If the student mentions smoke signals, ask what the chief would have to do if it were a rainy day. If the student mentions shouting or beating drums, say that the second chief was too far away to hear this. If the student says that the chief would have to walk or ride to the other village, ask if he could get a message there without leaving his own village. In general, probe to see if the student understands that the chief would have to send someone to deliver the message personally at the other village.)

6. DID THE INDIANS HAVE LIBRARIES? . . . WHY NOT? (If yes: TELL ME ABOUT THE BOOKS THAT WERE IN THE INDIANS' LIBRARIES.)

6a. (To be asked if the student's response to Question 6 emphasized the lack of bricks or some reason other than that Indians lacked written language): DID THE INDIANS HAVE BOOKS? . . . WHY NOT?

7. (With children who answered #6 by saying that Indians did have libraries or books, prepare them for #7 by explaining that Indians did not have libraries because they couldn't write their language, so they had no books.) IF THE INDIANS COULDN'T WRITE, HOW COULD THEY PASS ON WHAT THEY HAD LEARNED, ABOUT HUNTING OR FARMING? (If necessary, ask: SUPPOSE THAT AN INDIAN MAN WAS OUT HUNTING AND FOUND A NEW HUNTING GROUND. HOW COULD HE COMMUNICATE THAT TO THE REST OF HIS TRIBE?)

8. FOR A LONG TIME, PEOPLE COULD SPEAK BUT THEY COULDN'T WRITE. THEN, ALPHABETS AND WRITING WERE INVENTED. HOW DID THE INVENTION OF WRITING CHANGE THE WORLD? . . . WHAT DID WRITING BRING PEOPLE THAT THEY DIDN'T HAVE BEFORE?

9. LET'S THINK ABOUT COMMUNICATION IN THE TIME OF GEORGE WASHINGTON. IF GEORGE WASHINGTON WAS IN NEW YORK AND HE WANTED TO SEND A MESSAGE TO BENJAMIN FRANKLIN IN PHILADELPHIA, HOW COULD HE DO IT? (If the student correctly says that Washington would write a letter, ask how he would get it to Franklin. If the student says that he would mail it, ask: DID THEY HAVE MAIL BACK THEN LIKE WE DO NOW? . . . SO WHAT WOULD HE HAVE TO DO TO GET THE MESSAGE TO PHILADELPHIA?)

10. THINK ABOUT THE VERY FIRST BOOKS THAT WERE EVER MADE. WHAT DO YOU THINK THOSE FIRST BOOKS LOOKED LIKE? . . . WHEN THE PEOPLE MADE THOSE FIRST BOOKS, HOW DID THEY MAKE THEM?

11. FOR A LONG TIME, ANYTHING THAT WAS PUT DOWN ON PAPER HAD TO BE WRITTEN BY HAND--EVEN BOOKS. THEN, THE PRINTING PRESS WAS INVENTED, AND PEOPLE COULD PRINT NEWSPAPERS AND BOOKS, LIKE WE HAVE TODAY. HOW DID THAT INVENTION OF THE PRINTING PRESS CHANGE THE WORLD? . . . WHAT DID PRINTING BRING PEOPLE THAT THEY DIDN'T HAVE BEFORE?

12. ANOTHER IMPORTANT INVENTION WAS THE TELEPHONE. HOW DID THE TELEPHONE CHANGE THE WORLD? . . . WHAT DID THE TELEPHONE ALLOW PEOPLE TO DO THAT THEY COULDN'T DO BEFORE?

13. HOW DO BABIES AND YOUNG CHILDREN LEARN TO SPEAK THEIR LANGUAGE? . . . (If the student just says something like "from their parents," ask what the parents do.) SOMETIMES A YOUNG CHILD KNOWS WHAT S/HE WANTS TO SAY, BUT DOESN'T KNOW THE WORDS. WHAT CAN S/HE DO? . . . FOR EXAMPLE, IF THE CHILD WANTS TO GO OUTSIDE BUT DOESN'T KNOW THE WORD "OUTSIDE," WHAT COULD S/HE DO?

14. HERE, WE ONLY HAVE A FEW WORDS THAT WE CAN USE TO DESCRIBE DIFFERENT KINDS OF SNOW, LIKE SNOW, OR SLEET, OR SLUSH. BUT UP IN ALASKA, THE ESKIMOES' LANGUAGE HAS A LOT OF DIFFERENT WORDS THAT THEY CAN USE TO TALK ABOUT A LOT OF DIFFERENT KINDS OF SNOW. WHY IS THAT? . . . WHY DO THE ESKIMOES HAVE MORE WORDS FOR SNOW THAN WE DO?

15. CAN PEOPLE COMMUNICATE WITH EACH OTHER IF THEY DON'T SPEAK THE SAME LANGUAGE? . . . HOW? (If student says no or cannot explain, ask: WHEN COLUMBUS AND THE INDIANS FIRST MET, WERE THEY ABLE TO COMMUNICATE SOMEHOW?. . . HOW?)

16. SOME PEOPLE ARE DEAF--THEY CAN'T HEAR. CAN DEAF PEOPLE COMMUNICATE? . . . HOW? (If the student only mentions sign language or other nonverbal means, ask: CAN DEAF PEOPLE TALK?) (Also, if the student fails to mention lip reading, ask: IF A DEAF PERSON WAS SITTING HERE WATCHING YOU TALK, COULD THEY UNDERSTAND WHAT YOU WERE SAYING?)

17. SOME PEOPLE ARE BLIND--THEY CAN'T SEE. CAN BLIND PEOPLE COMMUNICATE? . . . HOW? (If necessary, CAN BLIND PEOPLE READ? . . . HOW?)

18. ARE THERE SOME WORDS THAT WE USE TODAY THAT DIDN'T EXIST 50 YEARS AGO? . . . WHAT ARE SOME EXAMPLES? (If the child says no, probe by asking DOES ANYONE EVER INVENT NEW WORDS . . . WHAT ARE SOME WORDS THAT MIGHT BE PRETTY NEW?)

19. SOMETIMES COMMUNICATION IS DONE WITH SYMBOLS INSTEAD OF WORDS (show examples, ask for meanings, and if necessary tell the student that the symbols mean "Railroad Crossing Ahead" and "No Bicycling"). WHY ARE THESE SYMBOLS USED INSTEAD OF WORDS? (If the student only explains why the sign is there but doesn't explain why the sign has symbols instead of words, probe for the latter explanation.)

20. MY BROTHER LIVES IN CHICAGO AND I WANT TO SEND HIM A BIRTHDAY CARD. WHAT DO I HAVE TO DO TO SEND HIM THE CARD? . . . OK, I PUT THE CARD IN THE MAILBOX. THEN WHAT HAPPENS TO IT? . . . THEN WHAT? ETC. [Probe to see if the child understands the following steps: I put the card in my mail box; the card is taken to my local post office; it is sorted and grouped with other mail headed for the Chicago; this mail is trucked to the airport and put on a flight to Chicago; there it is trucked to my brother's post office; there it is sorted by mail routes; then the mail carrier assigned to my brother's route delivers the card to his home.]

21. LET'S TALK ABOUT NEWSPAPERS. WHY DO PEOPLE READ NEWSPAPERS--WHAT'S IN THEM? . . . WHAT ELSE IS IN THE NEWSPAPER? (If no response: DOES SOMEONE IN YOUR FAMILY READ THE NEWSPAPER? WHY DOES ______ READ THE PAPER?)

22. HOW IS A NEWSPAPER MADE? WHAT DO THEY DO FIRST? . . . THEN WHAT? ETC. (Take whatever the student tells you and probe forwards or backwards from there, but in particular, see if the student knows (1) who decides what words to use and how they compose their stories (e.g., get the news and then type a report into a computer) and (2) how this is made into a newspaper (e.g., printed on a printing press).

23. AN IMPORTANT INVENTION AT THE TIME WAS RADIO. HOW DID RADIO CHANGE THE WORLD? . . . WHAT DID RADIO BRING TO PEOPLE THAT THEY DIDN'T HAVE BEFORE?

24. ANOTHER IMPORTANT INVENTION WAS TELEVISION. HOW DID TELEVISION CHANGE THE WORLD? . . . WHAT DID TELEVISION BRING TO PEOPLE THAT THEY DIDN'T HAVE BEFORE? [If it seems worth doing so, probe to see if the child has any understanding of how these inventions made instantaneous mass communication possible and eventually shrunk and homogenized the world.]

25. LET'S TALK ABOUT HOW TELEVISION WORKS. SUPPOSE ONE OF THE ASTRONAUTS CAME HERE TO YOUR SCHOOL TO TALK TO THE KIDS. NOW IF CHANNEL 6 FOUND OUT ABOUT IT, THEY WOULD SAY, "WOW--THAT'S BIG NEWS! ONE OF THE ASTRONAUTS IS COMING TO TALK TO THE KIDS AT THE SCHOOL--LET'S SHOW THAT ON OUR SIX O'CLOCK NEWS!" WHAT WOULD THEY HAVE TO DO? (If necessary, WHAT WOULD A TV STATION HAVE TO DO TO SHOW THAT ON THEIR NEWS PROGRAM?) [Probe to see if the student understands that the station would have to come to the school and videotape the talk, then take the tape to the station to edit. Also, see if the student has any explanation for how the tape then is "put on TV."]

26. BESIDES THE NEWS, TELEVISION BRINGS US ENTERTAINMENT SHOWS LIKE COSBY, OR JEOPARDY, OR STAR TREK. WHAT'S YOUR FAVORITE SHOW? . . . OK, LET'S TAKE _____. WHERE DO THEY MAKE _____, AND HOW DOES IT GET TO US, ON OUR TV? (Probe for details, especially to see if the child understands that the shows are taped in Hollywood or elsewhere, then later broadcast through a network to local stations. If the student says that they make videos and then send them to local stations, ask about live shows, like sports events, that we can watch as they unfold.)

27. WE HAVE TO PAY FOR SOME TV CHANNELS, LIKE HBO, BUT OTHER CHANNELS ARE FREE. WHY IS THAT? WHY ARE SOME PAY AND SOME FREE? (If necessary, ask YOU KNOW, ANOTHER THING ABOUT TELEVISION IS THAT THEY KEEP INTERRUPTING THEIR PROGRAMS TO SHOW COMMERCIALS. WHY DO THEY HAVE ALL THOSE COMMERCIALS ON TELEVISION? (If the student says that commercials provide a break so the performers can get ready for the next scene, point out that TV channels show commercials during movies that are already made, so they must have some other reason for showing commercials. If the student says that the sponsors want to show commercials because they want people to buy their products, accept this but probe further to ask why the television channels let these companies show their commercials.)

28. TELEVISION PROGRAMS SOMETIMES GET CANCELLED--THE NETWORKS TAKE THEM OFF THE AIR AND PUT ON SOMETHING ELSE INSTEAD. WHY DO THEY DO THAT? (Probe to see if the student is aware of the importance of program popularity and connects this to ratings and then to income from sponsors. If the student initially talks about reasons why a show would go off the air only temporarily (tornado, etc.), clarify that you refer to permanently getting rid of a show. If necessary, use the student's favorite show as an example: WELL, YOU LIKE TO WATCH ________. SOMEDAY THE PEOPLE WHO RUN THE CHANNEL THAT SHOWS ________ MIGHT SAY, "WE DON'T WANT TO SHOW ________ ANYMORE--LET'S GET RID OF IT." WHY WOULD THEY DO THAT?

29. HAVE YOU HEARD OF ELECTRONIC MAIL, OR E-MAIL? (If yes, WHAT IS IT? . . . HOW DOES E-MAIL WORK? . . . WHY MIGHT SOMEONE WANT TO USE E-MAIL INSTEAD OF REGULAR MAIL?) (Probe for two possible reasons--it's faster and it's less trouble because you don't need stamps, envelopes, etc.).

Table 1. Distributions and Correlation Coefficients Showing Relationships of Coding Categories to Grade Level, Achievement Level, and Gender[1]

	Total Sample	Grade Frequencies K	1	2	3	Grade Phi	Achievement Level Frequencies Low	Avg.	High	Ach. Phi	Gender Frequencies M	F	Gender Phi
Number of Students	**96**	**24**	**24**	**24**	**24**		**32**	**32**	**32**		**48**	**48**	
1. What is communication?													
0. Doesn't know/no relevant response	58	22	18	10	8	-49	22	24	12	-34	27	31	
1. Talking, having a conversation, speech	26	0	2	11	13	52	7	6	13	21	14	12	
2A. Do people like to communicate, or do they need to?													
1. They like to	12	6	3	2	1	-24	8	1	3	-28	4	8	
2. They need to (cannot give examples)	14	5	4	2	3		6	5	3		9	5	
3. Need to make plans (to meet, etc.)	11	3	1	4	3		3	6	2		5	6	
4. Need to communicate with family members	10	3	2	3	2		4	2	4		5	5	
5. Need to participate in school or work activities	16	2	4	2	8	27	2	5	9	24	11	5	-17
6. Need to in emergencies or when something is harming them	30	4	9	10	7		5	11	14	25	14	16	

Table 1 (cont'd.)

7. Need to be informed/ ask or answer questions	8	1	2	3	2		3	3	2		4	4
8. Need to communicate or understand feelings or needs	15	2	4	4	5		6	5	4		5	10
Question 2B. How would our lives be worse if we couldn't talk?												
0. Doesn't know/no relevant response	11	9	1	1	0	-48	4	4	3		7	4
1. Worse, no explanation	10	4	5	1	0	-28	4	4	2		3	7
2. Physical impediments inhibit speech	6	2	2	1	1		3	1	2		4	2
3. We would have to use sign language, read lips, or write messages	26	6	4	6	10		9	7	10		10	16
5. We wouldn't be able to get help in emergencies or when sick or hurt	8	1	3	2	2		2	3	3		3	5
6. It would be difficult to understand each other; we would not be as well informed, could not get needed information	27	1	5	11	10	37	5	10	12	20	14	13

Table 1 (cont'd.)

7. We would be isolated from others, lonely, unable to share thoughts and feelings	13	0	5	3	5	25	3	5	5		5	8	
8. Talking helps us to learn	6	0	1	3	2		2	1	3		3	3	

3. Some animals communicate by making noises, like dogs bark at each other. But we don't have to bark, we can talk. What does talking allow us to do that dogs can't do? . . . Is talking better than barking? . . . Why?

0. Doesn't know/no relevant response	20	12	3	3	2	-42	8	6	6		13	7	
1. No difference: barking is just as good as talking	6	1	1	2	2		4	1	1		5	1	-17
4. Barking is noisy, annoying, hurts your ears	6	1	1	3	1		3	0	3		2	4	
5. Talking is easier to understand, people can't understand barking	38	4	15	9	10	NL	6	16	16	30	17	21	
7. We can communicate better by talking, say more or more complex things, express emotions and plans, explain about emergencies	26	2	5	8	11	31	11	7	8		11	15	

Table 1 (cont'd.)

4. Back in time, the earliest people lived in caves. How did these people communicate?

0. Doesn't know/no relevant response	6	4	2	0	0	-29	2	2	2	4	2	
1. They talked (like today)	60	17	11	18	14		21	21	18	34	26	-17
2. They grunted, growled, made other vocal noises	16	2	6	3	5		5	6	5	9	7	
3. They talked in a different language	13	3	5	2	3		3	4	6	3	10	21
4. They used sign language or pantomime or acted things out	39	4	9	13	13	31	10	13	16	15	24	19
5. Says that there was a time when people didn't have language, could not talk	57	15	15	11	16		16	20	21	29	28	
6. They wrote or drew (typically on walls, ground, rocks)	19	0	1	6	12	50	6	5	8	6	13	18
7. They had to have face-to-face communication because they did not have telephones or mail then	10	1	3	3	3		4	4	2	5	5	

Table 1 (cont'd.)

5A. Before Columbus discovered America, the only people who lived here were the Indians. How did the Indians communicate?

0. Doesn't know/no relevant response	10	4	3	3	0	-21	4	3	3	7	3
1. They talked (like today)	54	17	12	15	10	-23	15	19	20	26	28
2. They talked, but in a different language/ their own language	27	1	7	5	14	44	10	9	8	15	12
3. They communicated through whoops and hollers	8	1	4	2	1		2	2	4	2	6
4. They used hand signals or sign language	21	5	2	4	10	30	5	9	7	11	10
5. They used written or symbolic language (carving on walls, scratching on ground, artwork)	12	0	2	4	6	28	2	4	6	4	8

5B. How would the chief of one Indian village get a message to the chief of a village five miles away?

0. Doesn't know/no relevant response	24	16	5	2	1	-57	11	6	7	13	11
1. Modern inventions: telephone, telegraph, tape recorder, mail service	8	1	4	2	1		3	3	2	4	4

Table 1 (cont'd.)

2. Send someone with a written message	20	2	9	5	4	NL	5	8	7		8	12
3. Go personally or send someone with a verbal message	56	7	14	15	20	39	14	21	21	21	29	27
6. Smoke signals, drum, light flashes	7	0	2	3	2		2	1	4		3	4
7. Yell	6	0	1	3	2		1	0	5	28	4	2

6A. Did the Indians have libraries? . . . Why didn't they have libraries?

0. Doesn't know/no relevant response	18	12	2	0	4	-49	8	7	3		9	9
1. Libraries weren't invented yet/they didn't know about them	24	2	7	7	8	23	7	7	10		12	12
2. There were no materials to build libraries or they didn't know how to build them	7	0	3	2	2		3	3	1		3	4
3. They couldn't or didn't read (or write)	16	6	5	1	4		4	5	7		7	9
5. They didn't have schools, libraries or other big buildings	16	4	6	6	0	NL	5	6	5		9	7

Table 1 (cont'd.)

6. They didn't have books or access to books	18	0	2	10	6	41	3	7	8		7	11

Question 6B. Did the Indians have books? . . . Why didn't they have books?

0. Doesn't know/no relevant response	16	11	3	1	1	-46	6	6	4		6	10
1. Books weren't invented/they didn't know about them yet	24	2	7	10	5	NL	5	11	8		14	10
2. They lacked materials to make books/didn't know how to make them	11	0	2	4	5	25	3	4	4		3	8
3. They didn't or could not read (or write)	13	5	1	3	4		4	4	5		6	7
6. Student says that Indians did have books	28	5	7	6	10		11	6	11		16	12

7. If Indians couldn't write, how could they pass on what they had learned about hunting or fishing?

0. Doesn't know/no relevant response	30	18	5	3	4	-55	13	11	6	-20	15	15
1. Through language or gesturing	10	1	2	3	4		3	3	4		4	6

Table 1 (cont'd.)

2. Visual representations (draw pictures, make carvings, mark on trees, put stick or flag in ground to mark spot)	14	1	3	4	6	21	5	4	5		5	9
3. Show them where to go or what to do/bring them to the spot	16	0	2	6	8	35	6	3	7		8	8
4. Tell them, teach them verbally	54	5	16	18	15	42	15	19	20		28	26

Question 8. For a long time people could speak but they couldn't write. Then alphabets and writing were invented. How did the invention of writing change the world?

0. Doesn't know/no relevant response/ they could write, do ABCs, spell	37	19	11	5	2	-56	17	10	10	-21	20	17
1. People started using or needing pens, ink, paper	10	0	4	3	3		5	2	3		6	4
3. People had an alternative or better way to communicate (including stating that it made things easier for people who couldn't speak or hear)	19	0	1	7	11	47	7	3	9		9	10

Table 1 (cont'd.)

4. People had books/ libraries	18	4	3	3	8		3	7	8		7	11
5. Learning became easier or enhanced; it was easier to pass on information	20	2	2	6	10	34	5	10	5		8	12
6. People could send written messages or letters	26	0	5	8	13	44	7	10	9		13	13
7. People no longer had to be face to face in order to communicate	17	0	1	6	10	44	1	8	8	27	9	8
8. People could read	7	1	0	1	5	31	1	3	3		5	2
9: If George Washington was in New York and wanted to send a message to Benjamin Franklin in Philadelphia, how could he do it?												
0. Doesn't know/no relevant response	15	7	6	0	2	-33	5	7	3		8	7
1. Modern inventions: describes using a device not invented at the time (telephone, telegraph, fax machine computer, etc.)	22	4	7	5	6		9	7	6		14	8
2. Modern transportation (train, car, bus, plane, etc.)	16	2	3	7	4		8	5	3	-17	8	8

Table 1 (cont'd.)

3. Send it by water: ship, bottle, boat, etc.	7	1	2	1	3		2	2	3		2	5	
4. Use the mail: write a letter, "send it," or put it in mail box	28	4	8	13	3	NL	13	5	10	NL	13	15	
5. Washington would have to go visit Franklin (or vice versa)	35	8	7	9	11		10	11	14		16	19	
6. Someone would be sent with a written message (recognition that today's mail system wasn't in place)	34	4	4	9	17	46	9	14	11		19	15	
7. A messenger would travel by horseback or wagon	12	0	1	6	5	32	3	5	4		9	3	-19
10. What do you think the first books looked like?													
0. Doesn't know/no relevant response	19	12	4	1	2	-45	9	6	4		12	7	
2. Books were made out of wood, bark, cardboard	14	3	3	5	3		7	1	6	NL	9	5	
3. Books had no color or no or few pictures	14	2	2	3	7	24	3	7	4		6	8	

Table 1 (cont'd.)

4. Books looked old, tattered, torn, dusty, rusty, bad	9	1	3	2	3		2	3	4		5	4	
5. People used pens, pencils, markers, crayons to make books	14	2	5	5	2		4	6	4		4	10	18
6. People used feather pens, ink, or paint to make books	19	2	1	5	11	41	8	3	8		8	11	
7. People used paper	26	1	9	8	8	30	10	9	7		13	13	
8. People wrote or drew pictures themselves	42	5	11	12	14	28	11	16	15		22	20	
9. Other: books were carved rather than printed or written by hand, etc.	36	3	8	11	14	35	12	11	13		17	19	

11. For a long time, anything that was put down on paper had to be written by hand—even books. Then, the printing press was invented, and people could print newspapers and books, like we have today. How did that invention of the printing press change the world?

0. Doesn't know/no relevant response	35	21	7	5	2	-63	17	11	7	-27		16	19

Table 1 (cont'd.)

1. Printed materials would be easier to read/writing in them would be neater or more permanent	8	0	1	4	3	24	0	4	4	21	4	4
2. You could have pictures or color (or more pictures or color)	9	1	4	1	3		1	5	3		4	5
3. People would not need to write; their hands would not get as tired, etc.)	22	2	3	7	10	32	8	6	8		13	9
4. The people who made books could work more quickly or would not have as much work to do	18	1	7	5	5		2	6	10	26	8	10
6. People could make multiple copies of things with greater speed or ease	14	0	1	6	7	36	5	4	5		6	8
7. Books could be read or enjoyed by more people; people had greater access to books	8	0	1	3	4	24	3	3	2		2	6
8. Books were printed in typeface instead of cursive writing	18	0	6	4	8	32	5	5	8		9	9

Table 1 (cont'd.)

12. Another important invention was the telephone. How did that change the world?

0. Doesn't know/no relevant response	9	7	0	1	1	-40	3	4	2		5	4	
1. You could call or talk to other people (without further explanation of why this was better)	18	10	6	0	2	-41	9	6	3	-20	9	9	
2. Responses that do not fit into subsequent categories: you could make plans more easily, call to see if someone was home before visiting, call to order pizza, etc.	6	3	1	1	1		2	3	1		2	4	
4. You could talk to people without being face-to-face with them	45	5	9	14	17	38	13	17	15		25	20	
5. You could communicate with people far away without having to write notes or letters	33	1	9	13	10	39	9	8	16	23	12	21	20

Question 13A. How do babies learn to talk?

0. Doesn't know/no relevant response	12	7	4	0	1	-35	5	4	3		10	2	-25

Table 1 (cont'd.)

1. They learn from older people; people teach them	65	11	14	19	21	35	21	21	23		27	38	25
2. They hear people talking and copy their speech	13	0	4	2	7	32	4	4	5		3	10	21
3. They have conversations with people	7	1	1	3	2		1	4	2		3	4	
4. They listen	18	4	4	6	4		6	7	5		10	8	
5. Speech develops as babies get older	12	4	5	2	1	-20	3	5	4		5	7	
6. Learning to speak is like learning to read: phonics, ABCs, etc.	9	0	2	3	4	21	3	2	4		5	4	
7. School, preschool, day care	10	0	1	4	5	28	5	3	2		5	5	

13B. Sometimes a young child will know what she wants to say but she doesn't have the words to say it. What could she do?

0. Doesn't know/no relevant response	14	9	3	1	1	-39	3	6	5		10	4	-18
1. Wait until she can say it	8	1	3	2	2		2	2	4		5	3	
2. Use baby talk or try to say the word	29	7	10	6	6		16	5	8	-32	14	15	

Table 1 (cont'd.)

3. Pull or touch the person to try to get his or her attention	12	1	2	3	6	24	5	2	5		9	3	-19
4. Go to the door, point outside, gesticulate	63	9	15	21	18	39	23	18	22		27	36	20
5. Cry, whine, use sound to draw attention	23	4	7	6	6		7	6	10		9	14	
6. Use sign language	8	0	1	5	2	28	3	5	0	NL	6	2	

14. Here, we have only a few words that we can use to describe different kinds of snow, like snow or sleet or slush. But up in Alaska the Eskimos' language has a lot of words that they can use to talk about snow. Why is that?

0. Doesn't know/no relevant response	34	17	11	5	1	-53	17	8	9	-26	19	15	
1. They are different or their language is different from ours	19	3	3	5	8	21	7	7	5		10	9	
3. They have more snow; they have spent more time in snow	48	3	10	15	20	52	10	16	22	31	22	26	
4. They know more about snow	11	1	3	5	2		5	5	1		6	5	
5. They have more types of snow	9	0	2	2	5	26	2	4	3		4	5	

Table 1 (cont'd.)

15. Can people communicate with each other even if they don't speak the same language?

0. Doesn't know/no relevant response	11	6	3	2	0	-28	6	2	3		7	4	
1. No	41	12	11	7	11		12	16	13		21	20	
2. Yes	44	6	10	15	13	28	14	14	16		20	24	
4. They could write it down	14	1	3	5	5	20	5	4	5		8	6	
5. They could teach or learn both languages	20	5	5	6	4		2	11	7	NL	12	8	
6. They could gesture or use sign language	37	7	6	11	13	25	11	15	11		15	22	
7. They could use an interpreter that speaks both languages	10	0	2	3	5	25	2	4	4		4	6	

16A. Can deaf people communicate?

2. No/doesn't know	25	18	4	3	0	-66	8	8	9		15	10	
4. They can use sign language	57	4	14	17	22	56	16	21	20		26	31	
5. They can read lips	6	0	0	3	3	26	2	1	3		1	5	17
7. They can write	11	0	2	2	7	34	4	3	4		4	7	

Table 1 (cont'd.)

8. They can talk (spontaneously says that deaf people can talk, before being asked directly)	17	0	6	6	5	27	5	9	3		13	4	-25
16B. Can deaf people understand what you say? . . . How?													
1. Doesn't know/says yes but cannot provide any explanation	9	3	2	4	0		6	2	1	-23	5	4	
2. No	65	20	21	12	12	-38	20	23	22		39	26	-29
4. Read lips	22	1	1	8	12	47	6	7	9		4	18	35
16C. Can deaf people talk? . . . How?													
0. Doesn't know/no relevant response	8	4	2	1	1	-19	2	3	3		7	1	-23
1. No	31	9	9	9	4		14	8	9		14	17	
2. Yes	47	10	12	12	13		15	17	15		23	24	
3. Yes, but their speech sounds different from other people's/not very clear/is hard to understand	10	0	0	4	6	35	6	2	2	-19	4	6	
4. Some can, some can't	10	1	1	2	6	28	1	4	5	17	4	6	

Table 1 (cont'd.)

17. Can blind people communicate? . . . Can they understand what you say? . . . How? . . . Can blind people read?

2. Yes, they can communicate	76	10	20	23	23	55	25	24	27		36	40	
3. Thinks that blind people can hear but not talk or can talk but not hear	7	5	2	0	0	-33	5	0	2	NL	2	5	
4. Blind people cannot read as sighted people do	44	23	10	8	3	-62	16	17	11		28	16	-25
6. They can read Braille	16	0	0	4	12	55	4	4	8		6	10	

18. Are there some words that we use today that didn't exist 50 years ago? . . . What are some examples?

1. No or doesn't know	10	7	3	0	0	-39	4	3	3		5	5
2. Yes (no examples)	32	9	6	14	3	NL	9	12	11		14	18
3. Poor examples: cites words that were in existence 50 years ago	25	3	8	5	9		10	7	8		14	11
4. Technical examples: cites words related to inventions or new technologies (computer, television, etc.)	16	0	3	3	10	41	2	5	9	24	9	7

Table 1 (cont'd.)

5. Popular culture: cites slang words or words used to describe artifacts of popular culture or new practices (compost pile, duh, cool, etc.)	13	0	4	2	7	32	3	4	6		9	4	
6. Cites both poor and good examples	9	0	3	3	3		2	3	4		7	2	-18
7. Cites good examples only	18	0	3	3	12	48	3	6	9	20	10	8	

19. Sometimes communication is done with symbols instead of words. Why are symbols used instead of words?

1. Doesn't know/no relevant response	36	16	10	5	5	-39	13	13	10		19	17	
2. Writing would have to be too small to fit on sign	22	1	5	7	9	29	6	7	9		9	13	
3. Symbols allow the sign to be understood by people who can't read	16	4	4	4	4		4	7	5		7	9	
4. Symbols are easier to see/words are harder to read	15	1	4	4	6	21	6	3	6		11	4	-20
5. Written signs take longer to read	15	2	4	3	6		2	4	9	25	8	7	

Table 1 (cont'd.)

6. Signmaker didn't want to take the time to write out words	14	2	2	7	3		3	6	5		6	8
7. Includes key idea that symbolic signs are quicker/easier to read	35	5	9	9	12	22	11	10	14		20	15
20. What do I have to do to send a birthday card to my brother in Chicago?												
1. Doesn't know/no relevant response	10	6	2	2	0	-30	4	5	1		7	3
2. Stamps: talks about attaching a stamp to envelope or about how the stamp is cancelled at the post office	27	1	8	7	11	34	7	9	11		10	17
3. Believes mail carrier picks up card and delivers to brother personally	19	11	5	3	0	-42	8	4	7		10	9
4. You or your mail carrier take card to local post office	67	7	17	19	24	56	20	23	24		31	36
5. Mail is sorted at local post office by destination	15	0	4	6	5	26	3	4	8	19	7	8

Table 1 (cont'd.)

6. Card is sent to Chicago by truck, plane, or boat	58	3	16	17	22	60	18	19	21		28	30	
7. Card taken to Chicago post office and processed there	46	5	10	11	20	45	15	12	19		18	28	21
8. Card taken directly to brother's house	17	1	5	7	4		6	9	2	NL	9	8	
9. Complete, accurate response	38	2	9	9	18	48	12	10	16		16	22	
21A. Why do people read newspapers?													
0. Doesn't know/no relevant response	7	6	1	0	0	-40	4	2	1		3	4	
1. News in general	49	11	15	10	13		14	19	16		24	25	
2. Good news	9	0	1	1	7	40	3	1	5		5	4	
3. Bad news	19	2	4	11	2	NL	6	5	8		9	10	
4. Advertising	19	1	5	4	9	30	8	5	6		7	12	
5. Announcements	19	2	4	6	7	20	7	6	6		8	11	
6. Sports	44	5	12	12	15	31	12	17	15		30	14	-33
7. Weather	33	3	10	11	9	27	6	15	12	NL	17	16	
8. Entertainment: puzzles, comics	24	2	8	5	9	26	4	9	11	21	16	8	-19

Table 1 (cont'd.)

9. Death notices	12	1	5	3	3		4	7	1	NL	6	6	
21B. Who reads newspapers in your family?													
0. Doesn't know/no relevant response	6	2	1	1	2		2	1	3		5	1	-17
2. Mother or other female relative	49	9	13	14	13		11	18	20	24	23	26	
3. Father or other male relative	80	21	21	22	16	-26	27	27	26		37	43	17
6. Student	21	0	7	1	13	53	3	8	10	22	11	10	
7. People read paper when they miss or do not watch TV news	9	1	3	3	2		2	2	5		6	3	
8. Mothers and fathers read different parts of paper	7	0	2	1	4	24	2	3	2		2	5	
22. How is a newspaper made?													
0. Doesn't know/no relevant response	10	8	2	0	0	-45	4	4	2		6	4	
1. They make paper from wood	21	6	3	5	7		9	7	5		11	10	
2. They gather news at the site	15	2	2	4	7	24	5	4	6		10	5	

Table 1 (cont'd.)

3. They get news from the television	12	0	5	3	4		3	4	5		9	3	-19
4. They write text with a pen, pencil, computer, or typewriter	64	7	15	22	20	51	22	18	24		28	36	• 18
5. Add illustrations	16	2	8	4	2	NL	7	7	2	-20	6	10	
6. Machine prints, copies, or stamps paper	59	9	13	16	21	38	15	21	23	22	31	28	
7. Papers are delivered	24	3	5	7	9	22	9	9	6		13	11	
23. How did radio change the world?													
0. Doesn't know/no relevant response	18	13	1	1	3	-53	7	6	5		11	7	
1. People could listen to music at home	62	8	19	22	13	47	18	21	23		29	33	
2. People could hear news and announcements about events	40	5	9	12	14	29	15	11	14		19	21	
5. People could listen to sports	7	0	3	0	4	NL	3	1	3		5	2	
6. People could get weather forecasts	22	3	7	4	8		4	7	11	21	10	12	
9. Other	12	0	1	3	8	39	3	4	5		4	8	

Table 1 (cont'd.)

24. How did television change the world?

0. Doesn't know/no relevant response	8	7	0	1	0	-44	3	3	2		7	1	-23
1. Cartoons	28	7	12	4	5	NL	9	9	10		15	13	
2. Entertainment shows (no mention of news, weather)	22	4	6	8	4		9	7	6		8	14	
3. News or weather reports (no mention of entertainment shows)	10	3	4	1	2		1	5	4		7	3	
4. Allowed people to watch videos or movies at home	16	2	6	5	3		3	5	8	17	5	11	17
5. Allowed people to witness events without being there	13	2	2	3	6	20	3	3	7		9	4	
6. Allowed people to learn things from educational shows	6	1	2	1	2		1	2	3		3	3	
7. Allowed people to see in addition to hear (compared with radio)	69	9	21	17	22	47	19	24	26	20	33	36	

Table 1 (cont'd.)

8. Mentions both entertainment and news	36	3	9	10	14	34	11	15	10		17	19	

25. What would Channel 6 have to do to show an astronaut talking to the kids at the school on the six o'clock news?

0. Doesn't know/no relevant response	30	17	8	2	3	-53	12	11	7		10	20	22
1. Put it on TV, show it	48	2	11	19	16	54	19	14	15		27	21	
2. Anchor person would describe event	18	0	2	8	8	38	8	4	6		10	8	
3. Reporters/camera people would come and tape the visit	62	6	16	20	20	50	17	20	25	22	36	26	-22
4. Videotape is taken back to TV station	23	2	4	6	11	33	8	5	10		16	7	-22
5. Videotape is played on VCR or VCR-like machine to broadcast it	21	1	8	7	5	NL	5	8	8		11	10	
7. The tape is edited	8	0	1	2	5	28	1	3	4		5	3	

26. Where is your favorite show made and how do we see it in Michigan?

0. Doesn't know/no relevant response	24	12	3	5	4	-34	10	9	5		12	12	

Table 1 (cont'd.)

1. Describes the process of making the show	31	5	12	7	7		11	7	13		14	17	
3. A video camera or tape machine is played	6	1	3	0	2		2	3	1		4	2	
4. Videotapes are sent from where they are produced to the local station	6	1	2	0	3		1	2	3		1	5	17
5. Radio waves: satellites, radio dishes, antennas transmit the show	9	1	2	1	5	23	1	4	4		7	2	-18
6. TV shows travel through electric wires, phone wires, power lines, cable lines to TV	39	6	12	12	9		15	10	14		20	19	
7. A central piece of recording equipment (camera, VCR, machine) is connected to all TVs	7	0	1	4	2		2	4	1		3	4	

27A. Why do we pay for some channels but not others?

0. Doesn't know/no relevant response	50	22	16	9	3	-60	21	15	14	-19	26	24	

Table 1 (cont'd.)

1. You pay only for good or new programs	20	0	6	8	6	31	5	8	7		13	7	
5. You pay for new movies	11	2	1	2	6	25	4	5	2		5	6	
7. Other	24	0	3	7	14	51	4	9	11	21	8	16	19
27B. Why do TV stations show commercials?													
0. Doesn't know/no relevant response	26	20	6	0	0	-77	10	9	7		14	12	
1. TV people need time to rest, take a break, correct a problem, rehearse next scene, etc.	34	2	8	11	13	36	13	9	12		12	22	22
3. Breaks are for viewers to get up and do something, make popcorn, etc.	7	1	1	3	2		1	4	2		1	6	20
4. Commercials give you information	24	1	6	9	8	30	9	7	8		14	10	
5. Commercials entice you to buy products or services	36	1	8	12	15	45	9	13	14		19	17	
7. Companies pay to advertise on TV	9	0	2	0	7	41	1	2	6	23	4	5	

Table 1 (cont'd.)

28. Television programs sometimes get cancelled. The networks take them off the air and put on something else instead. Why do they do that?

0. Doesn't know/no relevant response	29	15	7	6	1	-46	10	9	10	16	13	
1. Those on show are tired of doing it and want to quit	15	5	3	6	1		4	7	4	7	8	
2. Those who make show make mistakes, do the work wrong, argue, etc.	8	2	3	1	2		4	1	3	2	6	
3. Network executives don't like show anymore	7	2	1	3	1		2	3	2	0	7	28
4. People who make the show have run out of new ideas	6	0	4	1	1	NL	2	3	1	3	3	
5. Viewers don't like show anymore	33	1	5	9	18	55	9	10	14	16	17	
6. If people don't watch show, network doesn't make any money	9	0	2	2	5	26	3	1	5	6	3	
7. If people don't watch show, it's taken off	22	2	3	5	12	39	4	9	9	11	11	

Table 1 (cont'd.)

29. Have you ever heard of electronic mail, or e-mail? . . . What is it?

1. No	43	22	11	7	3	-59	20	13	10	-26	17	26	19
2. Yes (no elaboration)	9	1	3	2	3		3	4	2		5	4	
3. E-mail works on the computer	39	1	7	13	18	54	8	12	19	29	23	16	
4. E-mail is faster	33	0	8	9	16	50	7	10	16	25	20	13	
5. Typing e-mail messages is easier or neater than writing letters by hand	12	0	2	4	6	28	2	5	5		6	6	
6. E-mail doesn't require putting the message in envelope, taking to mail box, etc.	15	0	3	6	6	29	3	3	9	24	7	8	

---

[1] Numbers in the frequencies columns show how many students in each group were coded for mentioning the ideas represented by the response categories described at the left side of the table. Underlining indicates that the Chi-square for the underlined distribution was statistically significant at or below the .05 level. In these instances the phi coefficients (with decimal points omitted) are given in the phi columns (where significant linear trends were indicated) or else the letters "NL" appear to indicate that the relationship was nonlinear.